A McGraw-Hill Publication
San Francisco, Calif.

May 1, 1926
25 Cents

# Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

*Dedicated*
to the service of the industry

THIS giant Sangamo meter is an exact replica of the standard type H meter, held by Mr. Otis White, general superintendent and chief mechanical designer of the Sangamo Electric Company—who is responsible for the proven mechanical excellence of nearly four million Sangamo meters, produced since the inception of the company, over twenty-eight years ago. The big meter is not a dummy. Except in size, the parts are duplicates of the standard type H parts and the meter will measure true kilowatt hours under regular service conditions. The cubic content of the big meter is forty times that of the regular type H, and the torque is twenty times as great. Painstaking workmanship and exact reproduction of standard design are shown by the fact that the big meter will run accurately on a 5-watt load.

The first giant meter was built for the Central Illinois Public Service Company to be used in public relations work. It is attracting wide public interest. This meter will be on exhibition in the Sangamo booth at National Electric Light Association Convention.

Sangamo Electric Company, *Springfield, Illinois* New York · Boston · Chicago · Birmingham · San Francisco · Los Angeles

SANGAMO METERS

FOR EVERY ELECTRICAL NEED

# Sell 5½ Times as Many Sales

Make a permanent increase in a dealer's business and you have gained his everlasting confidence and gratitude. Benjamin Lighted Show Cases have a tested sales-attraction 562% greater than those with ordinary lighting.

Of 1804 people who passed a show case with ordinary lighting only 38 stopped.

Of 1798 people who passed a Benjamin lighted show case, similar in every other feature to the first show case, 213 stopped—*exactly 562% more.*

## Benjamin Show Case Lighting Equipment

can be easily installed in any show case, straight or curved, because of its sectional construction and variety of lengths. Two screws at each joint furnish the means of both electrical and mechanical connections. Standard tubular lamps, T-10, give an even distribution of light over the display. Lamps easily inserted or changed without disturbing the contents of the case. Simple in installation. Complete.

An all-conduit installation, which conforms to the most rigid inspection rules anywhere.

*Send for Special Show Case Lighting Information.*
*Address our nearest office*

## Benjamin Electric Mfg. Co.

120-128 So. Sangamon Street, Chicago
New York: 247 West 17th Street San Francisco: 448 Bryant Street
Manufactured in Canada by the Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Ontario

BENJAMIN
TRADE MARK


Journal of Electricity entered as second class matter February 17, 1921, at the post office at San Francisco, under the Act of Congress, March 3, 1879.
Published the 1st and 15th of each month at 883 Mission Street, San Francisco, California

MAY 10'26

©Cl B699924

# Journal of Electricity

With which is consolidated the "Electrical Journal" and the "Journal of Electricity, Power & Gas."

Devoted to the Economic Production and Commercial Application of Electricity

IN THE ELEVEN WESTERN STATES

A McGraw-Hill Publication

Published Semi-Monthly

Established 1887

C. T. HUTCHINSON, Editorial Director

G. R. HENNINGER, Associate Editor
R. N. PHELAN, Associate Editor

G. C. TENNEY, Managing Editor

W. A. CYR, Associate Editor
B. H. SNOW, Northwest Editor

VOLUME 56 | SAN FRANCISCO, MAY 1, 1926 | NUMBER 9

## Contents

**Editorials** ..... 321

**Development of the Electric Dairy Sterilizer in California** ..... 325
By BEN D. MOSES
A discussion of the application of electricity to dairy sterilization and its possibilities as a load-builder for the central station.

**New Central Supply Unit of the Pacific Gas and Electric Company** ..... 329
By R. I. MYERHOLZ
A description of the plant erected to effect a centralization of the company's supply department activities.

**The Making of a Municipal Electrical Code** ..... 333
By L. W. GOING
Some of the elements which should be incorporated in a municipal electrical code outlined by an authority on the subject.

**Discussion** ..... 323
**Advertising and Electricity** ..... 328
**New Ductile Weld Methods Developed** ..... 328
**Antique Electric Lamps Discovered in Colorado** ..... 335
**Central Station Construction, Operation and Maintenance** ..... 336
**Ideas for the Contractor** ..... 340
**Better Merchandising** ..... 344
**News of the Industry** ..... 348
**News of the Electragists** ..... 354
**Meetings** ..... 355
**Book Reviews** ..... 355
**Personals** ..... 356
**Trade Notes** ..... 358

**McGRAW-HILL COMPANY OF CALIFORNIA — 883 Mission St. — SAN FRANCISCO**
**Northwest Office: 1206 Spalding Building, Portland, Ore.**
**Publishers of JOURNAL OF ELECTRICITY**

JAMES H. McGRAW, President
C. T. HUTCHINSON, Vice-Pres. & Gen. Mgr.
J. W. OTTERSON, Secretary & Treasurer

WASHINGTON, Colorado Building
CHICAGO, 7 South Dearborn Street
PHILADELPHIA, Real Estate Trust Building
CLEVELAND, 401 Guardian Building
ST. LOUIS, Star Building
NEW YORK, Tenth Ave. at 36th St.

Subscription rates in United States, Canada, Mexico, Porto Rico, U. S. Possessions, Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Nicaragua, Panama, Guatemala, Paraguay, Peru, Honduras, Salvador, Uruguay, and Spain, $2.00 per year, 2 years $3.00. Elsewhere $3.00 Gold (13 Shillings). Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Copyright, 1926
By McGraw-Hill Company of California

Entered as second-class matter Feb. 17, 1921, at the Post Office at San Francisco, California, under Act of March 3, 1879.

Member Audit Bureau of Circulation

Printed in U. S. A.

**McGRAW-HILL PUBLISHING COMPANY, Inc.**
**New York**

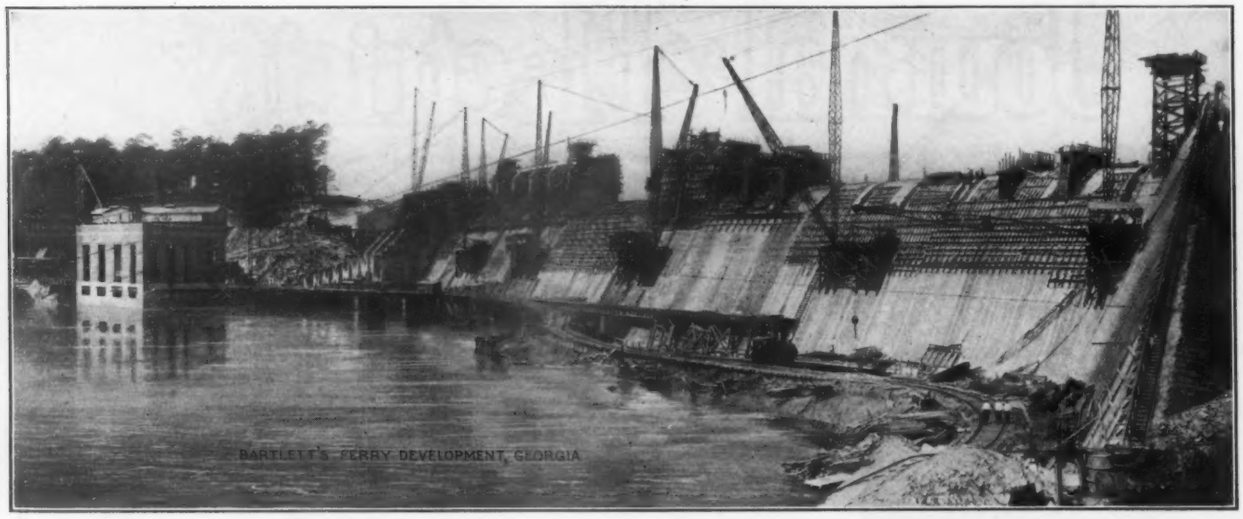
Publishers of
American Machinist—European Edition
(*Published in London*)
Industrial Engineer
Electrical Merchandising
Chemical and Metallurgical Engineering
American Machinist
Electrical World | Electric Railway Journal
Engineering and Mining Journal-Press
Bus Transportation | Engineering News-Record
Coal Age | Radio Retailing | Power

## *Spreading the Message of the Red Seal Home*

THE Red Seal plan in various sections of the West is gathering momentum, slowly but surely, and promises to mark the greatest step forward in co-operative sales promotion that this section ever has known. In California, British Columbia and Colorado progress is being made. For March, the first actual month of operation in California, fifty Red Seal applications were recorded. The quota which has been set for that state for the year is 2,000 Red Seal homes. In other sections quotas have been set accordingly.

The problem of popularizing the Red Seal idea is largely one of publicity. The initial step in the sales program is telling the Red Seal story to contractors, builders and architects. The next step is to reach the public. Before either of these can be taken the electrical industry itself must be fully sold and must possess a thorough grounding in the elements of the Red Seal idea.

It has been and is the intention of the Journal of Electricity to give the Red Seal program as much publicity as it warrants. In this manner the industry will be kept advised of all developments and will be able to better spread the Red Seal message. Watch the columns of the Journal for information regarding the progress which is being made.




# New Water Power Construction

NEW water power construction by Stone & Webster includes a variety of plants providing power for both public utilities and isolated industrial establishments. The work is widely distributed, the southernmost development being in Georgia on the Chattahoochee River, the northernmost in Michigan on the Menominee River, the most easterly in New Hampshire on the Merrimack River, the most westerly in Washington on the Baker River. Old plants have been reconstructed securing maximum power from existing stream flow, and new plants have been built, some high head and some low head with dams including both concrete and earthfill construction; there has been tunnel work.

This experience from designing and building water power developments of every type located in all parts of the country is provided by the Stone & Webster organization.

## STONE & WEBSTER

INCORPORATED

DESIGN · BUILD
OPERATE
FINANCE

BOSTON, 147 MILK STREET
NEW YORK, 120 BROADWAY
CHICAGO, FIRST NATIONAL BANK BLDG.
SAN FRANCISCO, HOLBROOK BLDG.
PITTSBURGH, UNION TRUST BLDG.
PHILADELPHIA, REAL ESTATE TRUST BLDG.

# EDITORIAL

### There is a Future for Young Men in the Utility Business

DURING the past month two very significant events have occurred which augur well for the possibilities of progress for the younger members of the great public-utility organizations. Two of the larger utilities of California have seen fit to elect to their respective directorates men who have, in effect, grown up in the organization—a radical departure from the old-time method of selecting a director purely on the basis of stock ownership with little or no regard for his knowledge of the problems of the business.

Harry J. Bauer has just been made a member of the board of directors of the Southern California Edison Company. While still attending law school, almost twenty years ago, Mr. Bauer began work in the legal department of the Edison company as a junior clerk. During the subsequent years he stepped up through the various grades of the legal department, finally becoming general counsel for the company.

The Los Angeles Gas & Electric Corporation has just elected F. E. Seaver to its board of directors. Nineteen years ago Mr. Seaver entered the employ of the company as an assistant bookkeeper, working up through the various ranks until he became assistant secretary in charge of stock sales, the position he now holds.

The significance of these two events is brought out further by the fact that in announcing these elections these large organizations have seen fit to lay much emphasis upon the fact that both of these comparatively young men practically have been brought up in the business, the destinies of which they are about to help direct.

---

### June Brides Mean More Electrical Appliance Sales

BETWEEN April and August in California approximately 20,000 couples will pass from single to wedded bliss. In other Western states the number of newlyweds will be as startling. Without entering into a discussion of the reasons for this seasonal activity on the part of county clerks, justices of the peace and pastors the statement may be made that these launchings of the matrimonial bark represent an opportunity to the electrical industry that should be turned into capital. In other words, tomorrow is not too soon to begin planning for a June Bride Campaign.

In California, as in past years, this seasonal sales activity will be under the direction of the California Electrical Bureau. This organization has sponsored the movement for several years, planning publicity, preparing posters and advertisements and distributing this material to the industry. Announcement has been made that the same procedure will be followed this year. In addition, the co-operative organizations in other sections of the country will follow the same procedure.

The object which these campaigns hope to attain is three-fold. In the first place, it is desired that the impression be made upon friends of the June bride that there is nothing as suitable and useful for a wedding gift as an electrical appliance. This year an attempt is to be made to attract the attention of the buying public to the fact that, irrespective of the month in which the bride is married, electrical gifts are most appropriate. In other words, the sales effort is not to be confined to June alone. Lastly, because every bride (and groom) has anniversaries, the impression is to be made that electrical gifts are suitable for these occasions.

But one criticism has been made regarding this activity, namely, that it tends to put useful electrical appliances into the luxury class by emphasizing them as gifts. This argument should carry no weight because the public already has been sold on the utility of practically all electrical appliances. Certainly the flatiron, toaster, percolator and waffle iron no longer can be classed as luxuries.

Past experience indicates that the industry has not developed fully the opportunity which this season of giving presents. To show the possibilities, it need only be stated than one large electrical dealer in California in 1925 sold more appliances during the month of June than he did during the Christmas season. He did this by properly dressing his windows and by devoting considerable newspaper space to appropriate advertising. His record can be equaled by any dealer or central station that expends a like amount of sales effort.

---

### Secretary Mellon Speaks About the Colorado River

SECRETARY of the Treasury Mellon has cast a new light upon the Colorado River situation. In a letter to the Senate Irrigation Committee commenting upon the Swing-Johnson Boulder Canyon bill he not only opposed the fiscal policy as outlined in the measure but also placed his finger upon the vital question for the determination of Congress

that is involved in this piece of legislation. He asks this question, "Should the United States spend $125,000,000 for the construction of a power and irrigation project?" He then proceeds to answer his own question in a direct and logical manner. He says:

"I believe that, in general, sound public policy in America, as elsewhere, is to encourage private initiative, and not to have government ownership or operation of projects which can be handled by private capital under proper government regulation. The government operation of railroads in this country was our largest experiment in this line, and a comparison of public and private operation in that field justifies my faith in private enterprise. Canadian and European experience is the same.

"To get the government out of business, whether it be in banks, utilities or monopolies, has become one of the most essential steps to permanent fiscal restoration of Europe, and I am loath to have the United States embark upon enterprises not strictly governmental in their nature.

"The fact that a government can furnish capital at a lower rate of interest is illusionary, if there be taken into account that the public project pays no tax and therefore does not bear its share of the cost of government. It seems to me that if the project is one that can pay its own way, private capital can be found. If it cannot pay its own way, then we should consider whether all the taxpayers throughout the United States should be taxed for the benefit of a part of the country."

In these words Secretary Mellon reiterates the stand of the present administration expressed first in the Republican party platform and since repeated frequently by President Coolidge and Secretary Hoover. With both houses of Congress favorable to the administration despite a radical bloc with no little power, it is difficult to imagine that the Swing-Johnson bill or any other legislation designed to force the government into any form of business will meet with a favorable vote. At any rate those who are close to the situation see little likelihood of the Swing-Johnson bill or any similar measure dealing with the Colorado River passing during the present session of Congress. This leads to the further conclusion that an amicable settlement of the Colorado River situation is still a dream of the future.

---

### Radio Dealers Should Play Ball

IN many localities a surprising number of otherwise enterprising and up-to-the-minute radio dealers refuse to take cognizance of the efforts of the electric utilities in reducing or removing radio interference. The utilities are spending appreciable sums and in many cases are doing far more than their normal share to co-operate with the users of radio sets. This is necessary, but it would seem that the radio dealers, being the main beneficiaries, at least should not antagonize the utilities.

Innumerable cases are reported wherein radio dealers continue to turn off complaints with the blanket statement, "Oh, it must be caused by one of the power lines in your neighborhood." If not that statement, then one as inane is made; and if not given out by the dealer himself, it is given out by his employees; the effect is the same.

Costly investigations carried out within the past two or three years have proved conclusively that half of all of the troubles bothering the average user of a radio receiving set originates within the set itself, or at least originates on the premises of the customer. These is no way can be charged to the electric utilities, being such things as loose connections, worn-out batteries, faulty tubes and even faulty operation of the set itself, thermostatically controlled household electrical appliances, lamps fitting too loosely in their sockets, and a multitude of other minor ills.

Of the remaining 50 per cent, less than half is traceable definitely to power equipment for which the electric utilities are responsible. This means that less than a quarter of the disturbances interfering with radio reception may be fastened in any wise upon the power companies. The utilities, in general, recognize their responsibility and are exerting themselves to remove the difficulties that are chargeable to their equipment. The final 25 per cent is chargeable solely to natural causes, according to the best radio authorities of the times, and must be expected at least with the present powerful long-distance receiving sets.

Education of the user of a radio receiver will enable him properly to qualify and classify the disturbances that interfere with clear reception and to do his part in eliminating them for himself and for the sake of his neighbor. Those radio dealers who otherwise are progressive would benefit themselves and everyone else concerned if they would step into line, accept their full share of the burden of interference elimination, assist in the proper education of the radio-using public, and stop trying to dodge behind a mythical bush.

---

### Public Relations Begins at Home

FOR courtesy and service no effort is spared these days by public utility companies. Much money is expended in advertising the idea that the public will receive the utmost in consideration and courtesy in all of its dealings with the company. Pamphlets are issued to instruct employees on the ways in which they should go, and classes are held to drive home the ideal of public service.

This is all fine, and yet there has come this gentle plea from one employee: "In all this service and courtesy," he says, "the management shouldn't forget that its first opportunity to exercise courtesy and service is upon its own employees. Here is a group, more closely associated with the utility than the public can ever be, in daily contact with the company for which they work. These employees are the company's liaison with the public,

for they are a part of the public themselves. Their families mingle with their neighbors and reflect the company's attitude toward them in word and action. Isn't it important that the executives of the company observe the rules of courtesy and service toward these employees that they wish the employees to maintain toward the rest of the world? Surely executives of power companies have a great responsibility in the example they set for those in the ranks, not only in courtesy and tact, but in all conduct which might reflect discreditably upon the organization, were it general. Don't you think that public relations, like charity, should begin at home?"

Be is said that this responsibility is realized by executives as a general rule. Be it said that in most companies those who have failed to act toward their employees as they ask employees to act toward the public are sorry and regretted exceptions to the rule. But the fact that one employee has made this statement is evidence of the fact that the responsibility is one which is deeply important. The executive must be sure that he is not asking of his workers something which he himself is not giving.

---

### Kids and Kites

POTENTIALLY kids, kites and high-tension wires form a deadly combination. Every year at this time there is a total of fatal accidents and costly power outages from this cause. Ignorance may be charged with 80 per cent of the kite-string accidents and experimental bravado with the other 20 per cent. At any rate, it would appear that a campaign of publicity directed to the kite-flying youth would serve to correct the evil. Information as to the serious nature of flying a kite into a high-tension line broadcast at this time would overcome the ignorance of the many youngsters and would frighten most of the bravado out of the few who might have a desire to "see the sparks fly."

---

### Electric Refrigeration Has Bright Future

PROBABLY the most spectacular growth in the history of the electrical industry has been that of radio. Six years ago radio as a commercial factor was unknown. The estimated sales of radio apparatus and supplies for the year 1926 are in excess of $400,000,000.

Nevertheless, it is believed that the household electrical refrigerator has a future in store for it almost if not quite as great as that of radio. From the World War period until 1923 electric refrigeration experienced a very slow growth. Beginning in 1914 with a total of some six hundred units in operation, there were only 10,000 in 1923; in 1925 this number jumped to 75,000, so that today at the beginning of the year 1926 it has been estimated that there are approximately 142,000 household-type electric refrigerator units used in the United States.

This fact is interesting enough in itself, but what is even more interesting is the potential market. Only about one per cent of the 14,500,000 electrically wired homes in the United States today is equipped with electrical refrigeration, and this in turn represents only about one-half of one per cent of the 26,000,000 homes in the country.

Little by little the electrical idea is infiltrating into the home life of the people. As the adaptability of the electrical servant to the solution of domestic problems becomes more fully known the domestic load increases by leaps and bounds. Electric refrigeration is the latest and one of the greatest exemplifications of the blessings of electrical service in the American home.

# DISCUSSION

## Electric Welding Job of Twelve Years Ago Recalled by Engineer

To the Editor:

Sir—The writer was very much interested in reading in a current issue of the Journal an account by Mr. Shields of Nevada Valleys Power Company, Lovelocks, Nev., describing how a field electric welding job on a valve was completed recently.

The writer has in mind a similar job which was accomplished some 12 years ago at Plant 2 of the Nevada-California Power Company, on Bishop Creek, during his incumbency as superintendent.

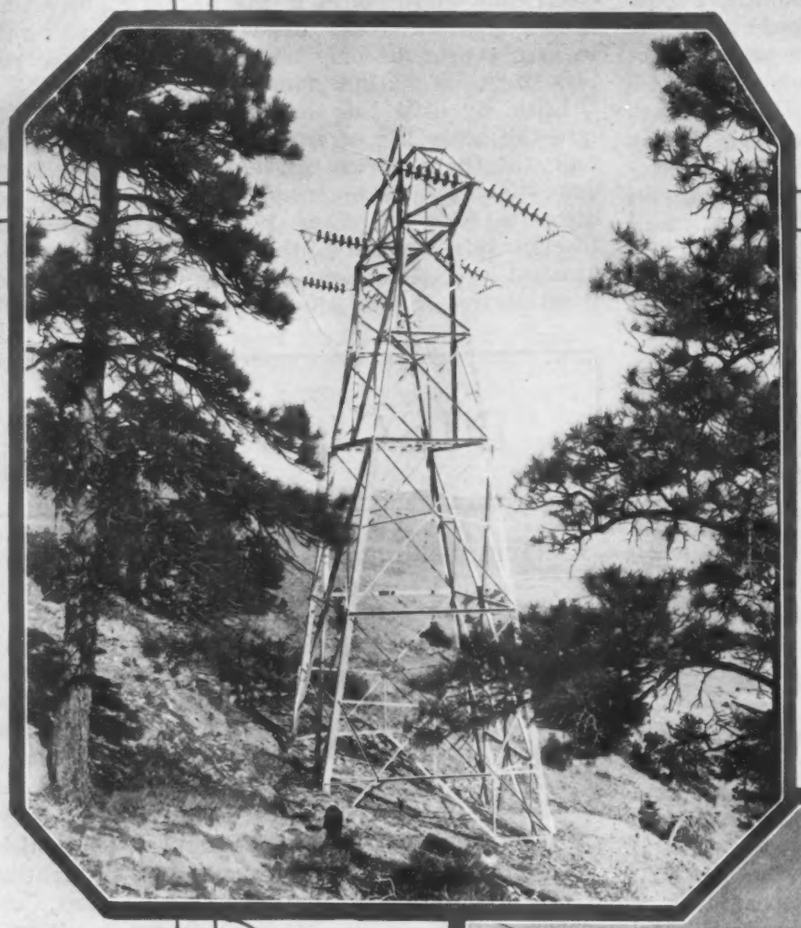
A special cast-steel Y having a diameter of 36 x 36 x 30 in., if the writer remembers correctely, operating under a head of 900 ft., failed while in service. Upon its removal from the header it was found to be cracked throughout its length along its horizontal axis, this evidently being a shrinkage crack from the fact that the crack remained open about ¼ in.

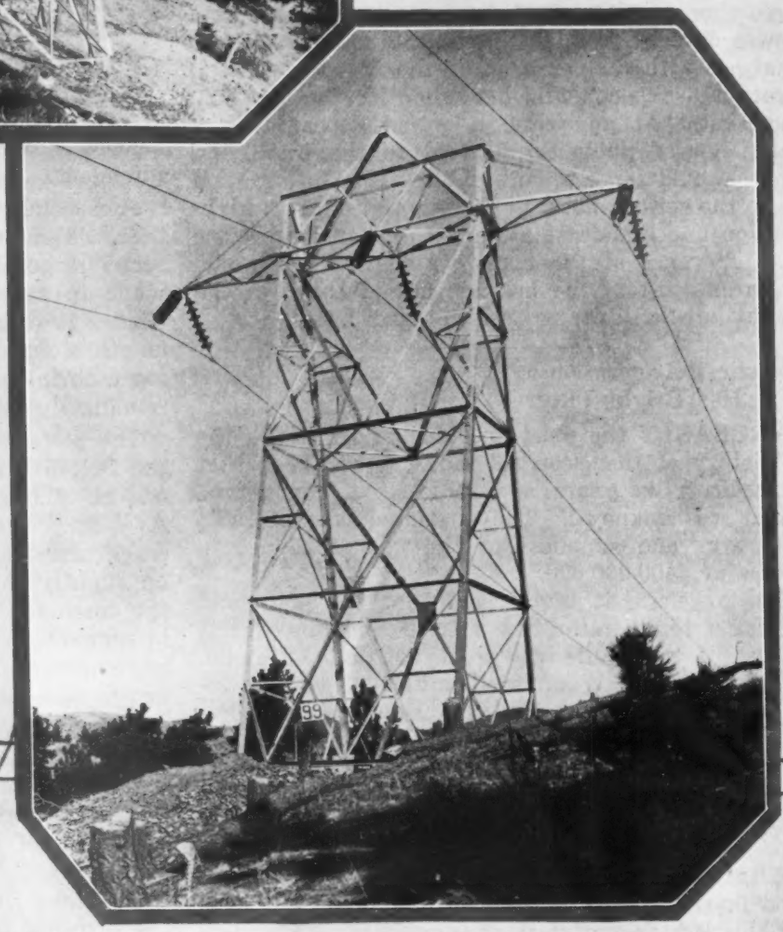
The piece was taken out, a welder sent up from the Pelton Water Wheel Company, San Francisco, and an exciter used to furnish current for the job. A V-shaped trough was chiselled out along the crack and metal was deposited in this and built up slightly thicker than the original thickness of the casting. The job required practically a week to complete. When put back into place there was no evidence of leakage. So far as the writer knows this casting still is in service.

Today such an undertaking would be commonplace, indeed, but 12 years ago electric welding had not reached much more than the experimental stages, and the job in question was considered something of a feat in those days.

D. R. KENNEDY,
Dept. Public Utilities.

Long Beach, Calif.,
April 8, 1926.





TOWERS on the 8-mile transmission line tying in the new Valmont steam plant of the Public Service Company of Colorado with its hydroelectric plant on Middle Boulder Creek of the Platte River. This line forms one side of the triangle of lines running between the Boulder hydroelectric plant, the new Valmont steam plant and the steam plants of the company in Denver. The maximum span on this Boulder line is 2,200 ft. long. The upper photograph shows one of the dead-end towers on this span. The line is operated at 90 kv. It is carried on double-circuit steel poles with pin-type insulators, except at such spans as pictured here. This line is made a link of an interesting balance plan between the company's hydroelectric plant and its steam plant, due to the fact that the hydroelectric plant water storage is used as a source for the condensation basin of the steam plant.

# Development of the Electric Dairy Sterilizer in California

By Ben D. Moses

Division of Agricultural Engineering, University of California, Executive Secretary, California Committee on the Relation of Electricity to Agriculture

*APPLICATION of electricity to sterilization in dairies is a fertile field for the industry. In California alone there are 30,000 dairies which offer to the power companies a possible connected load of 120,000 kw. In this article the author deals exhaustively with the question of sterilization and makes several recommendations based upon tests of equipment of this type.*

SHORTLY over a year ago Dr. J. J. Frey, chief of dairy inspectors for California, circularized the inspectors of the state with the question, "What, in your estimation, would be the biggest help in the way of electrical equipment for the small dairy?" Replies were received from various sections calling for different appliances, and, while there were demands for several different pieces of equipment, every letter contained some statement favoring a small electric dairy sterilizer.

The purpose of the sterilizer is to klil the bacteria on the dairy utensils after they have been washed and scalded, rendering them sterile so as to maintain uniformly pure milk with low bacteria count. This sterilization usually is effected by the application of heat sufficiently high to destroy bacterial life.

The state has drafted very definite rules and regulations controlling the operation of dairies selling market milk, and one of these regulations requires that all dairy utensils must be cleaned thoroughly and then subjected to a sterilizing temperature of at least 170 deg. F. for at least 15 minutes. Some dairies increase both the temperature and time beyond the actual state requirements, and all are forced to do some sterilizing. The sterilization in large plants is effected generally by the use of live steam in specially constructed tanks or large cylinders, and sometimes the steam is furnished under pressure. The small dairymen, however, with 12 to 20 cows neither have the space for such a plant nor feel justified in making investments proportionately high.

This sterilization requirement, rigidly enforced by a corps of dairy inspectors, is accomplished in a number of ways on the small farm. Sometimes the utensils are submerged in water in an ordinary wash boiler, tub or vat and kept at boiling temperature long enough to effect sterilization. The boiler may be heated over a wood or coal fire, over an oil or gas burner, or may be heated by electricity.

Because of the convenience of gas or oil as fuel as compared with wood and coal, sterilizing units consisting of some type of burner and some type of tank have been developed, and many have been sold to California dairymen within the last two years. While definite costs are difficult to obtain, it seems that the cost of operation of gas or oil-heated sterilizers varies between 4 per cent and 9 per cent per sterilization.

When the sentiment of the dairy inspectors was made known to the California Committee on the Relation of Electricity to Agriculture, it determined to investigate the practicability of electrically heating water for serilization purposes. It found that about a year ago Fred B. Fair of San Joaquin developed an electric sterilizer using a tank similar to that used for oil sterilization, equipped with an electric heating element. One of these tanks was tested in the laboratories at the University Farm and indicated that the electric sterilizer was full of possibilities. A little later Wellman Bros. of Modesto, who have been active in the development and manufacture of the oil-burner type of sterilizer, took up the study of the electric sterilizer. Since that time these two manufacturers report that there have been approximately one hundred electric sterilizers built and sold to the California dairymen.

That there is a very encouraging potential market for such equipment may be seen by the fact that there are approximately 30,000 dairies now operating in California that are using some type of small sterilizer.

Assuming an average of 4 kw. connected load per sterilizer, with an average consumption of 3 kw-hr. per day, there is then a potential connected load of 120,000 kw. and a potential consumption of 32,850,000 kw-hr. per year, which, at the average of 2 cents per kw-hr. would produce a revenue of $657,000 per year to the California power companies. Even if only 30 per cent of these potential users ever should materialize, the load is attractive.

Most dairies sterilize every day on a quite regular schedule, and while it is a daylight service the individual loads are small and are spread over a large area, producing a very desirable load factor.

The questions which arise in connection with the sterilizer are:

1. What should be its capacity?
2. How large a heating element is best?
3. How much water should be used?
4. How much will it cost the purchaser?
5. What will be the operation cost?
6. How efficient will it be from a sterilizing standpoint?
7. How long will it last?

Reference to many dairymen seems to point to the four-can size as being the most popular up to a herd of possibly 20 cows. First cost for this size should lie somewhere between $50 and $100. Cost of operation depends upon the electric rate but probably would not be much more than that of oil or gas-heated sterilizers in California. The size of the heating unit depends upon the efficiency of the tank itself to hold heat, upon the power rate effective at the farm, and upon other electric installations already on the farm.

Several sterilizers have been tested very thoroughly by the committee with the following objects in view:

1. To determine the effect of heat insulation upon the time required to heat and to cool the air within the sterilizer.
2. The effect that the quantity of water has upon the power required and upon the time needed for heating.
3. The effect that the size of the heating element has upon the power required and upon the time of heating.
4. The effect of outside air temperatures upon cost and time.
5. The relation existing between temperature within the sterilizer to that within the can and to that of the metal of the can.
6. The practicability of installing an automatic power cut-off, thereby relieving the farmer of the responsibility of shutting off the power.

Fig. 1. shows curves plotted for three types of insulation on the same amount of dairy equipment, using the same amount of water and the 5-kw. heating unit. Curve No. 3 is a time-temperature curve for a single thickness galvanized iron tank and top with no insulation against heat loss. The power was on for 24.64 min., the time of sterilization was about 21 min. and the rate of heating was somewhat slower and that of cooling somewhat faster than either curves No. 1 or No. 2.

Curve No. 2 shows the relation between time and temperature, using an air-jacketed tank and a single thickness galvanized iron cover. In this case 23.8 min. were required to bring the temperature up to 210 deg. F. and the sterilizing temperature of 170 deg. was held for about 27 min.

Curve No. 1 shows a condition for the air-jacketed tank and cover. The power here was on for 21.78 min. and the time for sterilization was a little more than 40 min. These curves show very clearly the importance of proper heating insulation.

Fig. 2 shows time-temperature curves of the same sterilizer comparing the 5 and 3-kw. heating elements. It is interesting to note that while the 5-kw. unit was on for only 22 min. it consumed only 2.07 kw-hr. and the time of sterilization was only about 34 min., while with the 3-kw. element the power was on for nearly 47 min., consuming 2.29 kw-hr., yet the time of sterilization was 47 min.

It is obvious from these curves that by increas-

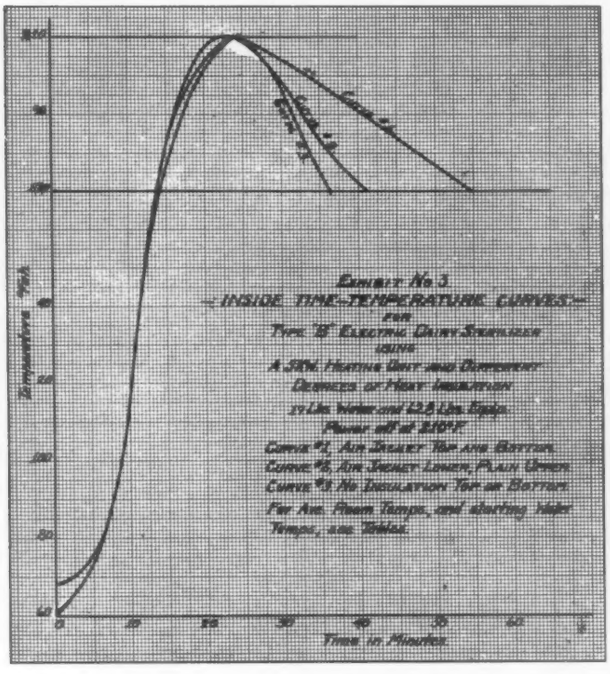


Fig. 1. Time-temperature curves for three types of insulation

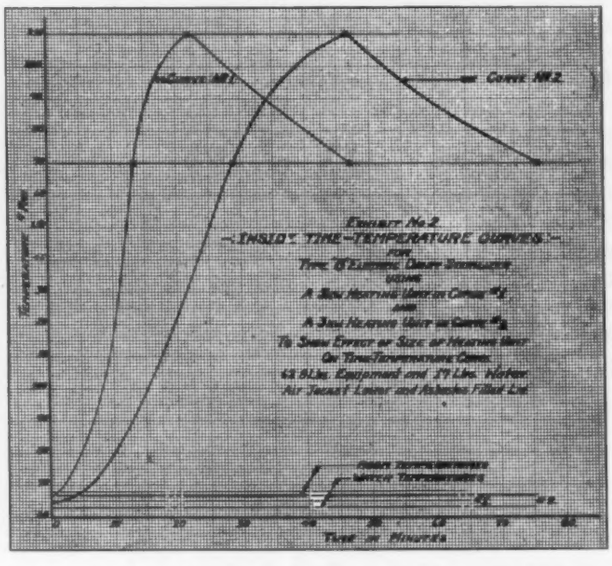


Fig. 2. Time-temperature curve for 3-kw. and 5-kw. heating elements.

ing the size of the heating element the time of heating is diminished very materially and the heating curve rears back. It is also obvious that the cooling curve is not affected, the cooling being dependent entirely upon the construction of the sterilizer and not upon the size of the heater. However, by increasing the wattage, the time of sterilization is decreased and the factor of safety above the required fifteen minutes also is diminished.

The manufacturer, then, should keep in mind the means of properly insulating his sterilizer. He also should recognize that the slope of the cooling curve is dependent upon insulation and very materially effects the efficiency of his apparatus.

The use of a thermostatic switch to interrupt permanently the electric circuit at some such temperature as 210 deg. will operate satisfactorily, provided cooling is not too rapid and that heating has not been rapid enough to decrease the time of sterilization below a safe minimum.

Fig. 3 shows the effect that the amount of water has upon the performance of the sterilizer. The time-temperature curves for these three conditions indicate clearly that the less water that can be used, the less will be the power consumed. Here again, however, is emphasized the relation existing between steepening of the heating curve and the time that the utensils are held above sterilizing temperature.

A careful study of these curves shows:

1. That the heat conservation is of great importance, a reduction in radiation losses making possible the use of a thermostat, and the increasing of time of sterilization without added costs.

2. The slope of the heating curve affects the total time the power is on and the total time the utensils are held above the sterilizing temperature.

The ideal sterilizer, then, would seem to be that one which uses the heating element just large enough, the correct quantity of water, and insulation to the extent that a thermostat cutting out the power between 200 deg. and 210 deg. F. will result in a minimum consumption of electric energy and will have safe margin of exposure to sterilizing temperature of 170 deg. F.

There are also certain factors entering into the installation of the sterilizer that cannot be overlooked. In the first place, installation should be made in such a manner as to cause no increase in the existing connecting load of the individual farmer. In other words, he should not have to pay any higher demand after installing his sterilizer than he did before. This may call for double-throw switches or similar installation. Secondly, care must be exercised that the farmer who is equipped to approximately the limit will not have to invest heavily in transformer or line-extension alterations. And third, excessive line drop, due to its comparatively heavy load, should be guarded against. Finally, it seems that four parties are called upon to co-operate if the electric dairy sterilizer is to be a success: The sterilizer manufacturer must endeavor

1. To hold down first cost.
2. To provide efficient insulation.
3. Carefully design shape so as to assist in water circulation, minimize "dead" spaces, hold down quantity of water.
4. So to select the heating unit as to reduce the expense of operation to a low cost, and yet provide a good factor of safety in sterilizing time.
5. To incorporate some kind of satisfactory automatic control.

The appliance manufacturer will be called upon

1. To develop a satisfactory heating element—rugged, of long life, simple construction and reasonable cost.
2. To furnish switches and controls that can be depended upon and will hold down the fire hazard and reduce danger to operators to a minimum.

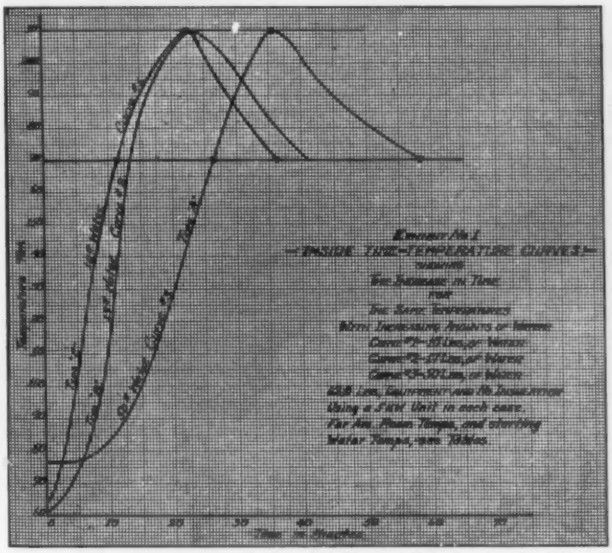


Fig. 3. Time temperature curves for variable amounts of water.

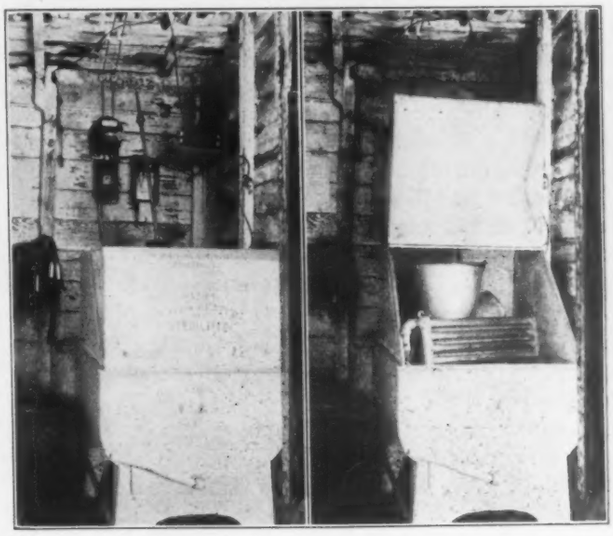


Fig. 4. Recently developed type of electric dairy sterilizer showing open and closed views.

The power companies should

1. Carefully study each installation so as to give the farmer the benefit of the lowest rate schedule.
2. Advise as to proper cut-ins, size of wire, and location of fuse and switch blocks.
3. Warn against carelessness in turning off the current.

The farmer himself will be called upon

1. To follow the manufacturers' instructions.
2. To provide a good place for the sterilizer and protect the parts against abuse.
3. See to it that the sterilizer is grounded, and
4. Realize that heat is the sterilizing agent, that it is generated by electricity, and that electricity flow makes the meter go around.

## Advertising and Electricity

By Don Francisco*
LORD & THOMAS, Los Angeles

BENJAMIN FRANKLIN was a man of great vision. I wonder, on that memorable night when he and his son were flying their little silk kite out in the storm, whether he could see the thing which he was collecting in his Leyden jar as we use it today.

It is less than one hundred and seventy years since Franklin's experiments, yet today we use this power to assist in almost every field of human endeavor. It heats our houses. It drives our locomotives. It lights our cities. It makes the deaf hear and the blind see. It even resuscitates the drowning. As soon as this power was captured, controlled and directed, it became so much a part of the daily life of man that now we can hardly imagine a world without it.

Advertising, like electricity, is indefinable. It is a power which moves minds as electricity moves elements. It runs in a current; it has momentum; it is founded on the magnetism of character just as electricity is founded on the magnetism of matter.

The other day, I saw a great crane lift some enormous steel girders to the top of a tall building. Nothing held them to the crane but this fluid power we call electricity. In a moment some one pressed a button somewhere and the girders fell. The power had been released. The big steel surface of the crane was, in itself, helpless to retain them.

The other day I was looking through the pages of an old magazine and I came across an advertisement long forgotten. I recalled the day when the name of the thing there advertised was a household word throughout the length and breadth of the land. A few years ago some one had pressed a button somewhere. The true power of advertising had been shut off. The maker tried everything he could to lift the name again, but his advertising was gone as completely and permanently as the power of the magnetic crane.

Concentrating a message into an advertisement is much like charging a Leyden jar: A man never fully realizes what his undertaking is until he begins to put his mind on paper. When one begins to picture a thing as he wishes the world to see it, he has taken the first step toward making the thing as he would have the world know it.

Advertising is that electrifying power which takes these vague notions we have and changes them into policies we are willing to fight for.

Advertising is the power which electrifies the salesman, the wholesaler, and the dealer into a spirit of service beyond the mere sale.

Just as in electricity Franklin proved the power of points to conduct, Volta demonstrated the ability of the current to travel, Faraday discovered the power of currents to rotate, and Edison turned the spark into a steady light—so today energetic advertising men are giving their lives in an effort to add little by little and step by step to the world's knowledge of this great omnipresent power which we call advertising.

*Statement before Los Angeles Electric Club, Los Angeles, March 8, 1926.

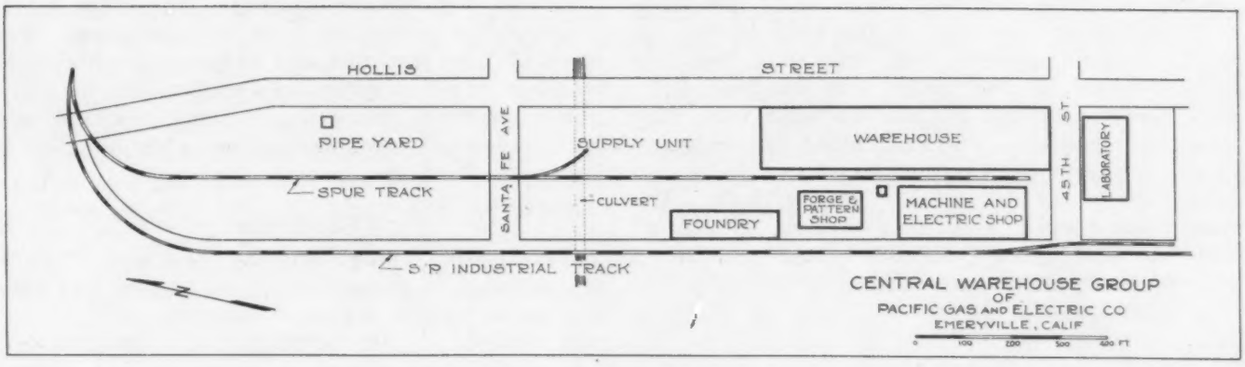
## New Ductile Weld Methods Developed

ALMOST simultaneously, two methods for producing ductile welds have been developed by research scientists working in different laboratories, far apart. Both of the methods, similar in some respects, mark a decided step in the utilization of the heat of electric arcs in the joining of metal parts or the building of metal structures. One was developed in the Schenectady research laboratory by Dr. Irving Langmuir; the other was developed in the Thomson research laboratory at Lynn, Mass., by Peter Alexander, both of the General Electric Company.

In both processes, air is excluded from the metal by means of a bath of hydrogen or other gas. The formation of oxides and nitrides in the weld metal thus is prevented, and the fused metal is as strong and ductile as the original metal.

In brief, the method developed by Dr. Langmuir is to pass a stream of hydrogen between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms. These combine again a short distance in front of the arc into molecules of the gas, and in so doing liberate an enormous amount of heat so that much higher temperatures can be obtained with this than with the usual welding methods. Since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal.

The process developed by Mr. Alexander is based on the utilization of the chemical and physical properties of hydrogen and other gases in their molecular state. This process aims primarily at the prevention of the formation of the nitrides and oxides in the arc-deposited metal that limit the ductility of the usual arc welds.




# New Central Supply Unit of the Pacific Gas and Electric Company

By R. I. Myerholz

Assistant Engineer, Division of Civil Engineering, Pacific Gas and Electric Company.

TO EFFECT a centralization of supply department activities the Pacific Gas and Electric Company in 1924 decided upon the construction of a central supply unit. At such a location the warehousing, manufacturing, repairing, checking and distributing of the large quantities of materials and equipment used annually for plant maintenance and in new developments could be handled more efficiently. Located in the Emeryville industrial district the plant consists of 12¾ acres of land adequately supplied with transportation facilities for the distribution of the materials to the different divisions of the company's extensive system.

The group consists of three major divisions, namely, a pipe storage and wrapping yard, a warehouse and shop unit, and a laboratory. The laboratory is a bureau of the engineering department and is not connected with the supply department other than that the testing of materials and equipment carried on by it bear a direct relation to those maintained at the supply warehouse. It was deemed advisable, therefore, to have the two located adjacent to each other. Each major division is located on a separate unit or area, as the property is divided into three parts by two cross streets.

Spur track facilities are very good. There is an industrial track along the entire west side of the property and the company has constructed a spur extending the length of the pipe yard and supply-department units at their approximate center. The laboratory is served by a spur from the industrial track.

One of the most valuable and important features of the property is that the yard and floor levels are about 4 ft. above the street and railroad grades. This permits the use of depressed spur tracks to establish loading docks at car floor height, greatly facilitating the handling of materials on and off the cars, as well as cutting down handling costs. This feature made it neces-

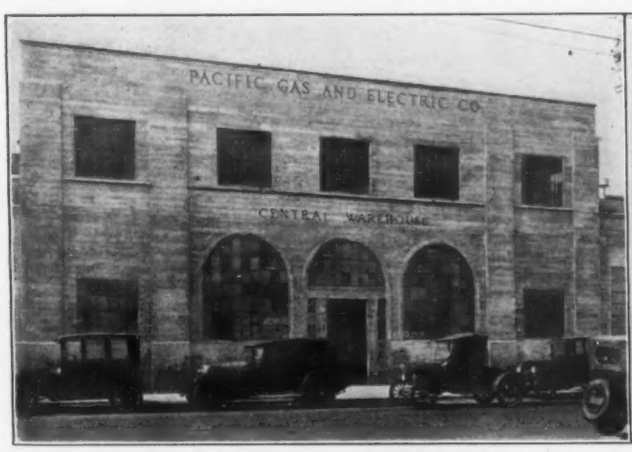



Fig. 1.—Office portion of warehouse.

Fig. 2.—Front of warehouse building

sary to construct retaining walls about the property, and along each side of the spur tracks. A gravity-section concrete wall was used for this purpose where the wall height was less than 4 ft.; reinforced concrete T or L-section walls were used for greater heights. The walls along the boundary of the property are surmounted by a link-chain fence, the posts set directly in the wall. The fences are topped with four strands of barbed wire on out-riggers. Suitable gates are placed at road and railroad entrances into the property.

A creek channel 30 ft. wide and 12 ft. deep extended across the property at one point in the supply department unit. An old 12-in. sewer line was buried at one side of this channel which carried with it a 6-ft. easement. Unless this channel could be filled in, the yard area would be reduced by approximately 10,000 sq. ft. In view of the value of the land it was deemed advisable to construct a culvert that would carry both the stream flow and sewer line and thus reclaim the area above. A double box-culvert was constructed of 7-ft. square barrels. The sewer was laid on the flow line and surrounded with a lean concrete jacket, thus making it accessible at all times without interfering with the operations in the yards above and without the necessity of tearing out any of the culvert structure.

### Pipe Yard

The pipe yard, situated on the north unit of the group, is used for the storage and soil-proofing of the gas and water pipe used by the different branches of the company. All wrought-steel pipe before being used is soil-proofed with a coating of asphaltum and roofing felt especially made for this purpose. Special machines are used to do this work. Prior to the establishment of this centralized equipment this work was done at the different points where pipe was being used. This old system required the transporting of the equipment from one part of the system to another. It has been found, however, that wrapping the pipe at a central point and the subsequent distribution to the point of use materially cuts down the cost; also the process is continuous and experienced men can be maintained to do the work. Still another advantage is that there always is a stock of pipe available and shipments can readily be made on short notice. In conjunction with the pipe yard three pipe-fitting testing machines are used to test all pipe fittings before shipping them to the point of use.

### Warehouse

Warehousing, manufacturing and repair units are situated in the buildings on the central area and make up the supply department unit. This unit consists of five buildings, eash designed for the special work for which it is intended. This unit covers 301,676 sq. ft., with a ground-floor area in the buildings of 129,352 sq. ft. The yard area adjacent to the buildings is paved with concrete and water-bound macadam. Suitable concrete loading and unloading platforms 12 ft. wide extend along either side of the spur track above mentioned. These platforms also are used as a runway for transporting material from one building to another. They are of reinforced concrete 6 in. thick. The wearing surface was cast monolithically with the base and is treated with a metallic hardener to prevent excessive wear and dusting. Yard drainage is provided by an underground system connected with the culvert mentioned above.

Warehousing is carried on in a building 130 ft. wide by 600 ft. long and with a second floor 9,100 sq. ft. in area over the central portion for office purposes. The main floor is used for general storage and is equipped with steel bins for the storage of small materials. The floor is laid out with runways, and the material is transported over these by means of electrically driven trucks and stackers. A dock is situated at the ends of this building for the receiving and shipping of materials. These docks are of sufficient size to accommodate three trucks simultaneously.

Executive and accounting departments of the supply units are accommodated on the second floor of this building. This portion of the building is steam-heated with a low-pressure vapor system. The boiler and vacuum pump are on the main floor below.

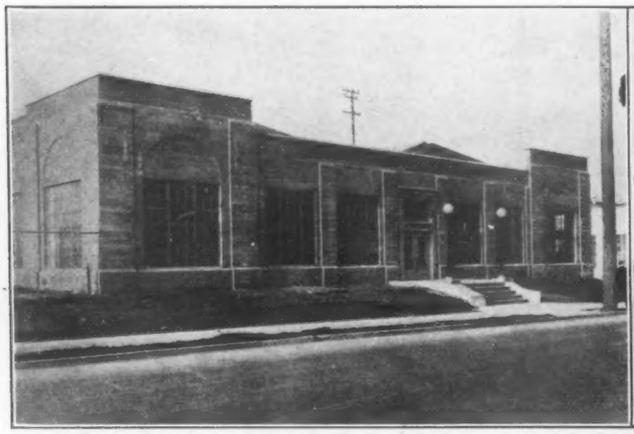


Fig. 3.—Laboratory building.

Fig. 4.—General view of shop buildings.

The manufacturing and repair division of the supply department is housed in three buildings to the rear of the warehouse and on the opposite side of the spur track. The machine and electrical shop, the largest of the group, is 108 ft. long by 264 ft. wide and is equipped with two traveling cranes of 10 and 20-ton capacity, the smaller one in the machine shop and the larger one in the electrical shop. The machine shop is equipped fully with lathes, shears, punches, presses, and other machines necessary for manufacturing switches, junction boxes, and for reconditioning worn machinery.

The electrical shop is equipped with winding machines, coil-varnishing rooms, and drying ovens for the manufacture and repair of motors, transformers, and other electrical equipment. An oil filter for filtering transformer and switch oil also is installed. Two 5,000-gal. oil storage tanks buried beneath the insulator-storage area are connected to the filters by a suitable pipe system. The electrical testing department is located in this shop and is equipped with the necessary transformers, regulators, and switchboards for testing all the electrical equipment built and repaired by the electrical department as well as that purchased from equipment companies. Adjacent to this shop is a concrete paved area 50 x 108 ft. in size for insulator storage and testing.

To the north of and adjacent to the machine shop are the forge and pattern shops housed in an 80 x 120-ft. building. The forge shop contains the regular blacksmith equipment and the electrical and oxyacetylene welding departments. Equipment for electrical welding consists of two motor-generator units of 60-90-volt, 200-amp. capacity, supplying current for the d. c. welding. A 440-volt single-phase a. c. butt welder also is provided. The welding-current outlets are of the interlocking switch type, thus safeguarding the workers.

The pattern shop adjoins the forge shop, separated from it by a fireproof wall. This shop is equipped fully with the most modern tools for pattern-making. Steel shelving provides storage for all active patterns.

The foundry is to the north of the pattern and forge shops in a 60 x 220-ft. building. All castings of bronze, brass, copper and iron used by the supply department are made there. The shop is equipped with an iron cupola of 3,000-lb. capacity and with three oil-burning brass furnaces. A 5-ton traveling crane is provided in the iron foundry. A portion of this building provides storage for scrap copper, brass and aluminum.

All of the shop buildings are provided with high and low-pressure illuminating gas, compressed air and electric power. The outlets for each are located conveniently in the shops at points accessible to the different kinds of work that are being carried on. All wiring is in conduit, and the power control is accomplished from power panels located adjacent to each group of machines controlled. All machines in the shops are direct electric drive.

Power for the group is supplied by an outdoor transformer station consisting of three banks of transformers of the following capacities: 290-kw., 3-phase, 220-volt. for the power circuits; 182-kw., 220/110-volt, 3-phase for the lighting and power purposes; 60-kw., 3-phase, 440-volt for power used by the electric locomotive crane; 15-kw., single-phase, 440-volt for weldings and 125-kw., single-phase, 2,300-volt for testing purposes. Distribution of the power is controlled by a switchboard adjacent to the transformer station and housed in a small fireproof building located between the machine and forge shops. The 8-in. centrifugal fire pump also is in this building directly connected to a 75-hp. motor. This pump is capable of boosting the pressure in the fire mains to about 125 lb. per sq. in.

### Laboratory

The laboratory building and yard make up the third unit of the group and are located on the block to the south of the warehouse building. The building is 98 x 170 ft. The exterior is similar to the other buildings of the group, but the interior has been constructed to meet the highly specialized work carried on by this department. The testing

Fig. 5.—Pipe and supply-unit yards.

Fig. 6.—Depressed spur track facilitates loading.

of all materials used on the company's construction and repair work is taken care of in this unit. Special research work is also carried on.

The several laboratories making up this unit are the standardizing research, chemical, physical, concrete, instrument repair, machine shop, shipping room, and the large general test room. These laboratories all are on the main floor and are equipped fully. The main test room is 32 x 98 ft., with an average height of 25 ft. It is equipped with a 15-ton traveling crane, and also is provided with a mezzanine floor for the storage of miscellaneous materials. The heating plant and main switchboard for the building are in this room.

The different laboratories all are connected by means of a system of covered trenches through which any future piping or electrical wiring can be installed without altering the building in any way. A separate transformer station provides power for this unit; it is in the yard at the rear of the main test room. It is connected to the main switchboard through conduit and the trench system. The yard of this unit also is surrounded by a chain-link fence similar to that of the supply department.

### General

Much study was given toward the determination of the type of building which would be the most suitable for a group of this nature. After due consideration of all types the class C type with concrete walls and timber frame was decided upon as being best fitted to meet all of the controlling conditions.

Simplicity of construction, quality of appearance, durability and economy were the prime factors considered in the selection of the proper building type. The concrete of the exterior walls was poured against the rough side of the form lumber, giving a pleasing wall surface. The walls are not plastered, and hence in order to make them as waterproof as possible hydrated lime or diatomaceous earth was added to the concrete to give a very dense and easy-working mixture. These materials also gave a concrete that very easily could be worked into all sharp angles and recesses, giving sharp and unbroken lines to the architectural details of the buildings. Form work was well rendered by the contractors, and the finished walls have the appearance of a special plaster treatment.

Roof trusses and interior framing are of timber. The trusses rest upon columns built into the exterior walls. The second floor of the warehouse is of laminated mill-type construction with a T & G wearing surface. This type of floor insures a high resistance to fire and thus cuts down that hazard.

Concrete was used for the floor of the warehouse while that of the electric and machine shop is of a redwood block. The forge and foundry floors are a special sandy clay, well rolled to form a uniform surface. In the pattern shop a double wood floor has been provided.

Lighting of all the buildings is accomplished by means of windows and skylights. The relation of floor area to lighting area was maintained in the ratio of approximately 4 to 1. This ratio was found to give the most efficient working light. Artificial lighting in the buildings was designed to give the most uniform working light possible. Offices and laboratory buildings are equipped with Glassteel diffusers, which give a semi-indirect lighting; shops and warehouse are equipped with dome reflectors for direct light.

All buildings are protected by a fire system directly connected to the fire pump mentioned above and also to the city mains. Thus ample protection is assured at all times.

Grounds about the laboratory and the parking area between the sidewalk and the warehouse building have been beautified by lawns and low-growing shrubs; climbing vines are placed against the building walls. This arrangement breaks up the cold monotony of an industrial district and makes it a more pleasing place in which to work.

The buildings were designed by the engineering department of the company and the construction was handled by contract. The period of construction extended over fifteen months but was carried on in such a way that the use of the group was made possible about six months after construction started.

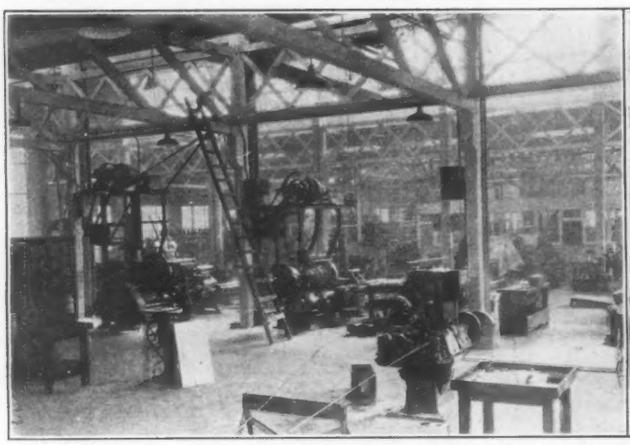


Fig. 7.—Interior of machine shop showing typical structural framing.

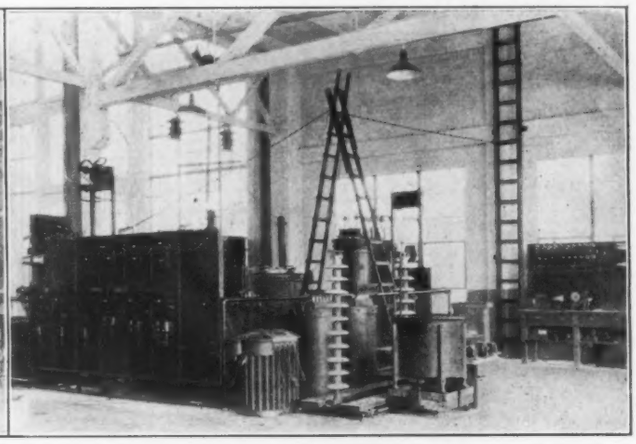


Fig. 8.—Showing testing board, transformers, regulators and other equipment.

# The Making of a Municipal Electrical Code

By L. W. Going*
Chief Electrical Inspector, City of Portland

*THE author, being a recognized authority on the subject, outlines some of the elements that should be incorporated in a municipal code and explains the necessity of such codes as supplements to the National Electrical Code.*

BEFORE attempting to explain what a municipal code should be I am going to tell a story which aptly illustrates what a municipal code should not be. It is related of an eminent diplomat that on one occasion he spent a long time writing, revising, and correcting an important letter, and then submitted it to a friend with a request for his opinion of it. The friend read and re-read it, and at length remarked, "It is beautifully written and seems very clear, but, if you will pardon my saying so, I cannot discover from it exactly what you mean to do." "Ah, thank you," exclaimed the author, "it is a perfect success," and at once signed and despatched it. Indefiniteness was the result he had labored for, a result possibly of value in a diplomatic note but a very undesirable though not uncommon quality of codes in general. Those responsible for the administration of codes will agree that, of all the qualities of a municipal code, definiteness is at once the most desirable and essential. Rules may be rigid or they may be lax, but, if they are to be workable, they must be definite.

This paper is not intended as a finished exposition on the subject of code-making. It is intended merely as a suggestion of the more essential features of a municipal electrical code and to point out wherein such a code may differ from the National Electrical Code.

### Purpose of a Municipal Code and Essential Features

A municipal electrical code is evidence of recognition by a municipality of its responsibility for unsafe electrical conditions. The aceptance of this responsibility by municipalities has become so widespread that today the principle of city regulation of electrical wiring and equipment seldom is questioned. The National Electrical Code cannot, unless adopted as an ordinance, be enforced in uninsured buildings and, even in insured buildings upon the payment of a stipulated charge defective electrical work is permitted to remain. Responsibility for unsafe electrical conditions therefore must be assumed by the municipality, and to meet this responsibility is the purpose of the municipal electrical code.

It is not possible in a brief of this kind completely to cover the essential points of a municipal code. Such a code should, however, make adequate provision first, for the assignment of the duties of inspection to some designated public official, or for the creation of the office of electrical inspector; second, for the licensing of electricians and the issuance of permits; and third, for standards of materials and methods of construction, equal to or better than those prescribed by the National Electrical Code.

### Licensing Contractors

Second only to the creation of an adequate and competent inspection force is the plan for licensing electricians. The licensing provision holds the contractor or worker strictly accountable for his acts and tends to weed out, so far as can be accomplished through legislation, incompetent and dishonest contractors. The question of licensing seems to be a weak point in the electrical control and inspection in the majority of codes today. Many localities are without a license law, and in others the laws are unsatisfactory or inoperative.

For over ten years in the city of Portland the licensing provision has been in successful operation and has proved an effective barrier to the entrance into the local field of transient, irresponsible contractors. Enforcement of the license law in this city has been a chief factor in building up a class of contractors of unquestioned standing in the community—men who not only are familiar with the code requirements but who take pride in installing electrical work of the highest standard. The slogan in Portland is not simply, "Do it electrically"—it is, "Do it better electrically."

Another valuable feature of the license law pertains to the enforcement of the code rules, which is simpler when electrical work is confined to a limited number of competent contractors. This results in fewer corrections and greater speed and efficiency in inspection work. To make the license law 100 per cent effective the code should provide that no electrical wiring or equipment be installed without a permit nor placed in service without a certificate of approval.

The standards of materials and construction form a most important part of the code. In the opinion of some, the standards of construction should not be included in the ordinance; in other words, the ordinance should be merely an enabling act, with

*From a paper presented before the convention of the Northwest Association of Electrical Inspectors, Portland, Jan. 11-12, 1926.

suitable restrictions and penalties providing for the publication of desirable standards of construction by some responsible official. In support of this contention they cite the difficulty of passing an ordinance prescribing standards of construction as well as the difficult task of bringing about the enactment of amendments which may be urgently demanded by advances in the art. The State Electrical Code of Oregon is an example of the use of the enabling act while the City Code of Portland is an example of legislation prescribing standards of construction. The determining factor in the choice of methods in any case depends upon local conditions. If the city charter is so drawn that authority to formulate codes can be delegated to some responsible official, then the best procedure is to make the municipal ordinance an enabling act.

Standard specifications for materials and devices are prescribed by the Underwriters' Laboratories and every municipal code should, and usually does, contain a provision requiring that all materials, devices, and appliances intended for use on light or power circuits shall conform to these standards. It is unfortunately true, however, that unapproved devices are being installed daily and used in cities which have this provision embodied in their codes, and manufacturers, both foreign and domestic, still continue to do a thriving business in cheap, unsafe devices. This state of affairs cannot and will not be remedied until municipal authorities awaken to the fact that they and they alone are responsible. Certainly the unsuspecting public cannot be held responsible when devices which meet no standards of safety freely are offered for sale by merchants who, in most instances, are as equally unacquainted with electrical hazards as the public. Are we then as representatives of the city government negligent in our duties as protectors of the public's life and property? Can we afford to delay longer attempting means of combating this evil tendency? Can we justify our failure to undertake the elimination of a situation which daily is growing more serious because of the rapidly increasing uses of electricity?

The remedy does not reside in the mere definition of the term "approved" nor does it reside in the code requirement that all electrical devices must be approved. The evil is too deeply rooted for that. The only effective remedy, and one which has been successfully pioneered in the city of Portland for a period of several years, is the code provision for licensing dealers selling or offering for sale electrical materials and devices, and including in this license the requirement that dealers restrict their sales to such devices as comply with the standards of safety prescribed by the Underwriters' Laboratories. There is nothing complicated about the dealer's license provision as contained in the Portland Code—nothing that cannot be adopted and enforced in other cities. The more cities that get behind this movement, the easier will its enforcement become. If universally adopted it would eliminate the manufacture of cheap, unsafe equipment.

Electrical materials not only must be approved —they also must be properly installed. The methods of installation form a most important feature of a municipal code. It is not within the province of this paper to advocate or suggest the type of wiring method desirable, which is a matter resting entirely with each community. A type of wiring acceptable in one community may not meet the standard desirable in other communities. Some cities are more progressive than others in this respect, the general tendency being toward the adoption of the all-metal standard, viz., conduit, armored cable or metal raceways. The gradual adoption of higher standards of construction is largely a matter of education, not only of the electrical contractor, but of the architect, builder and owners as well. We will have with us always the opposition of those who predict the ruination of the industry through the establishment of higher standards of construction—a prediction not founded upon fact, at least when viewed in the light of past experience.

The standards of construction included in a municipal code should aim for the accomplishment of three things. First, they should be adequate to meet all conditions that arise in the field of electrical construction so that it will not be necessary for contractors to substitute methods of their own. Second, they should provide for standardized methods as far as practicable without sacrificing flexibility. Third, the methods of installation, including circuit and feeder capacities, size of switches, cutouts, etc., required in various installations should be defined so clearly as to leave no doubt in the contractor's mind as to what is necessary to satisfy the requirements of the ordinance.

Standards of construction which meet the above requirements will place all electrical contractors upon a common basis so far as the class of construction on which they submit bids is concerned, and a municipal code that accomplishes this purpose cannot fail to receive the hearty appreciation and effective support of the local electrical fraternity.

All municipal codes prescribe standards of construction which have for their basis the requirements of the National Electrical Code, but it seems to be a common characteristic of municipal codes to include special local rules. Does this indicate a lack of faith in the National Code? Is the tendency toward special local rulings due to the lack of something in the National Code that is essential in a workable municipal code, or is it merely exaggerated local pride which prompts the making of special local rules?

The charge has been made that it is wasteful of time and effort for local code committees to attempt to work out local electrical rules varying from the national standard and from each other; that the making of rules governing electrical installations is a function of national, not local, authorities; that many and diverse electrical codes in different localities inflict a real waste upon the electrical industry and upon the public. The work

of drafting a code cannot be classed as a pleasant diversion. Experience has taught us that a good municipal code can result only from long and patient labor, contributed by busy men of wide experience who can ill afford to waste time upon useless endeavor. There must, therefore, be some underlying reason for this local effort.

### The Origin and Justification of Special Local Rules

If you will trace the history of the average municipal code back to its inception you will find that, with the exception of necessary administrative features, it is identical with the National Code in effect at the date of its passage by the council. Then shortly after the birth of a code, some contractor discovers or invents a method of installation which, while still within the law, omits something deemed essential in an installation that is to be permanently safe and satisfactory. Competition soon forces other contractors to adopt the same methods and the practice becomes general. The evil practice referred to may consist of poor workmanship, or inadequate feeder or circuit capacity, or the use of wiring methods not suitable nor desirable in the type of building that is being wired. For instance, the National Code recommends that "special attention be paid to the mechanical execution of the work"; a municipal code must demand it. The National Code specifies the amount of current a given size wire will carry safely, but fails to provide any rule by which the circuit and feeder capacity may be determined at the time of installation; a municipal code must provide definite minimum requirements relating to circuit and feeder capacities in buildings in order that adequate capacity will be available when the installation is completed and placed in service.

Contrary to prevailing opinion, municipal authorities and the electrical industry in general do feel more or less responsible for the trust which the public has reposed in them—a public which is not electrically trained and to which electrical wiring and equipment are merely incidents. This sense of responsibility dictates that some action be taken to maintain the safest and best standards of construction and to curb any attempt made to lower such standards. So a local code committee is formed and this committee, working in conjunction with the city inspector, drafts special rules to overcome this condition. They do this, not because special local rules are desirable, but because the rules of the national standard fail to provide a satisfactory remedy. The conditions calling for special rules frequently arise and eventually are incorporated as a part of the municipal code. This, then, is the point of departure from the national standard.

The question naturally arises, are these special rules justified? Are they of sufficient importance to justify a departure from or addition to the national standard? Possibly not, if measured strictly in terms of fire hazard. But the city ordinance of today is becoming more than merely a set of minimum requirements; it is coming into use more and more as a standard which prescribes the best construction methods by engineers and contractors who not infrequently use the code as a substitute for specifications—a use for which it was not originally intended but nevertheless a use which must be recognized by the compilers of the code. When an installation passes city inspection it is assumed by the public to represent the latest and best methods available. This presumption or trust is not entirely justified, but it is so well founded that municipal authorities and local code committees are forced to give it recognition when drafting a code.

### Putting the Code to Work

After the code has been compiled and edited in the exact form which the law is expected to assume the next problem is to put it across. If the personnel of the local code committee has been selected wisely, little difficulty will be experienced. It is very important that members selected to serve on a local code committee represent the views and opinions of the various groups or individuals directly affected. Failure to do this may mean the difference between success and failure. Team play is essential. No enterprise can be successful unless all individuals or groups are animated by a common purpose, nor can an enterprise be successful if any individual or group attempts to play a lone hand.

---

## Antique Electric Lamps Discovered in Colorado

ONE of the earliest types of incandescent lamps was salvaged recently from the meter loading test board in the Leadville office of the Public Service Company of Colorado. The board was dismantled to permit the installation of a later model board.

Details regarding the historical value of these lamps of which there are five, were revealed by E. L. Siekmann, district manager at the Leadville office in a letter to Messrs. Clare Stannard, C. A. Semrad, Guy W. Faller, V. L. Board and G. B. Buck, officials of the Public Service Company in Denver, who were presented with these valuable antiques of the electrical world.

The lamps are actual examples of Edison lamps as manufactured in 1884. One of them is owned by the Smithsonian Institution and it is described in detail on page 56 of the Smithsonian Miscellaneous Collection, publication No. 2717.

About two years ago, according to Mr. Siekmann, the company was called upon to investigate the lighting in St. George's Episcopal Church in Leadville. Four similar lamps were then found installed in the ceiling, some sixty feet above the floor level, where they had been in operation since 1884, according to labels found on the lamps. The long years during which these lamps remained unchanged in the church do not indicate that they had an abnormally long life, inasmuch as the church is used only once a year for services.

# CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

## Pole-Life Extended by Full-Length Creosoting

### Vacuum-Pressure Process Accomplishes Deep Penetration of Preservative and Also Bleeds out Surplus

By R. S. MANLEY, President, Texas Creosoting Company, Orange, Texas.

Engineering by imitation too often controls the decision as to the species and kind of pole to be used.

The possibility of securing great returns from a careful study of all of the facts concerning all of the various kinds of poles is overlooked. The expenditures for pole lines constitute such a large percentage of the total costs that once this fact is understood the demand for more comprehensive study becomes insistent.

It may seem to be an inconsequential matter to decide on the type of pole to be used, but as a matter of fact such decision is an important and far-reaching one. Consideration and determination of the following is necessary:

1. Weather conditions in the country to be transversed.
2. Ice, snow, sleet and wind loads.
3. Wire load.
4. Effects of decay fungi.
5. Presence of wood-destroying insects.
6. Fiber strengths and the modulus of rupture of various woods.
7. Chemicals which when injected into the wood will most completely defeat the decay fungi and the wood-destroying insects.
8. Amount of preserving chemical to be used and the most efficient method of application.
9. How the wood shall be prepared for treatment and how seasoned.
10. Where and what size to make the cuts and holes for the reception of crossarms.
11. Whether to use pole steps or not.
12. First cost.
13. What the expectant life should be.
14. How much per year will each class of pole under consideration cost when spread over a long period of, say, 50 years.

Fig. 1. Typical case of ground rot on untreated pole.

Every person is familiar with decay as illustrated in Fig. 1., but few realize that all decay is unnecessary and constitutes one of the greatest waste problems of our day. The Bureau of Agriculture states that "wood properly creosoted will last indefinitely." Wood-boring insects insidiously destroy poles, crossarms and in some places even furniture, never appearing on the surface. They have an "inside job," as may be seen in Fig. 2, representing actually what is going on inside of large numbers of poles in California.

The yellow pine pole creosoted for its entire length has gained in favor among all engineers at a very rapid rate. This is due to the low cost per year, the permanence of the installation, the absence of service interruptions, the immunity from attack of fungus organisms or insects and the universal record of great length of life. The Forest Products Laboratory in its bulletin issued April 6, 1923, recommends the following values for modulus of rupture of various pole woods:

| | |
|---|---|
| Pine—southern yellow, dense | 7,300 |
| Pine—southern yellow, sound | 6,300 |
| Pine—lodge pole | 4,500 |
| Cedar—western red | 4,300 |
| Cedar—western white | 3,400 |
| Douglas fir—dense | 7,300 |
| Douglas fir—not dense, coast region | 6,300 |
| Hemlock—western | 5,600 |

These strength data, taken in conjunction with the fact that the strength of pine is not diminished appreciably during the creosoting while the fir group usually requires such high steam temperatures to effect penetration of preservatives that the strength is lessened materially, make pine the ideal pole wood.

The holiday season of 1924 with its sleet and ice storms through the central Mississippi Valley in which a total of more than 60,000 poles were lost, of which less than 50 poles were creosoted pine, convinced all engineers who knew the facts that the most economical pole in the long run is a pine pole properly creosoted for its entire length. Fig. 3 shows that the breaks sometimes occur at points other than the ground line. A creosoted pine pole retains its strength continuously; its original effective diameter remains undiminished. Take the New Orleans-Mobile lead of the Bell company; built in 1897, inspected in 1925 and practically every pole 100 per cent sound. Poles were removed and re-used in other lines in order that the line might be rebuilt for heavier service. Strength

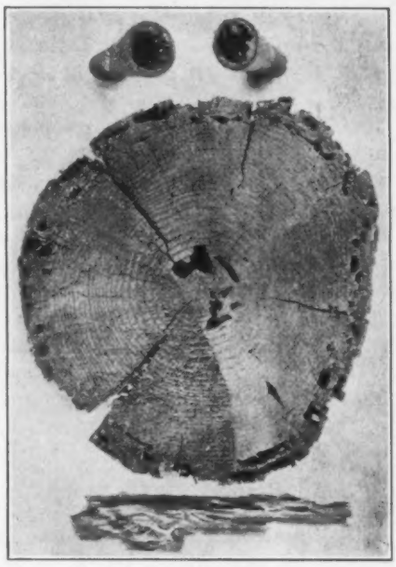


Fig. 2. Examples of destructive work of Termes Bellicosus on California poles, arms and pins.

tests of these 28-year-old poles showed no practical change in strength.

Also it should be remembered in connection with this record that the machinery and processes for creosoting have been improved greatly in the intervening years. If the poles treated in 1897 were practically 100 per cent sound in 1925 and fit to be re-used in a smaller lead with the expectation of many more years of life, how long is it reasonable to expect the modern creosoted poles to last? Certainly with modern methods 50-year life should be a conservative estimate.

Steps taken in the preparation of creosoted pine poles may be interesting to those who are not familiar with the processes. Southern yellow pine poles are found in the forests extending from Virginia to Texas. They grow straight and strong, though seldom reaching a usable length of more than 90 ft.

Fig. 3. "Poles do not always break at the ground line."

During the seasoning the pine poles are stacked on creosoted skids, each tier separated from adjacent tiers by creosoted spreaders to eliminate the chances of incipient decay during seasoning. When opportunity does not

Fig. 4. Poles loaded on tram cars ready for entry into the vacuum cylinders.

exist for air seasoning, poles are seasoned artificially in the cylinders by the use of low-pressure live steam and high succeeding vacuum. Time required for this artificial seasoning varies directly as the moisture content and cross-section of the poles vary. Temperatures used in this process never exceed 275 deg. F. so that the wood fiber is not injured.

When air seasoning has been completed the poles are roofed, framed and bored as directed by the customer and then loaded into tram cars, Fig. 4. The load is cylindrical so that it can be run on rails into a double-ended cylinder with hinged doors at each end, Fig. 5. It is in these cylinders that the preservative, most commonly creosote oil, is forced into the wood. Various processes are used, but the one which has proved the most efficient for the treatment of poles is termed the Rueping process, named for its patentor. This process consists in injecting into the wood under heavy pressure a large quantity of creosote. By the pre-injection of air pressure the return of at least 50 per cent of the total injection is accomplished. The advantages of this process are that it secures deep penetration at a minimum cost for preservative and at the same time leaves the wood dry and quite free from the objectionable presence of loose creosote on the outside of the pole.

Each cylinder is capable of holding three large carloads of poles, and each pole is measured carefully so that the cubical contents of each cylinder-load is known accurately. With this information and knowing the number of pounds of preservative to be injected into each cubic foot, the total injection is computed. Recording gages showing volume, temperatures and pressures enable accurate work to be performed. If the poles already are air-seasoned the first step is to fill

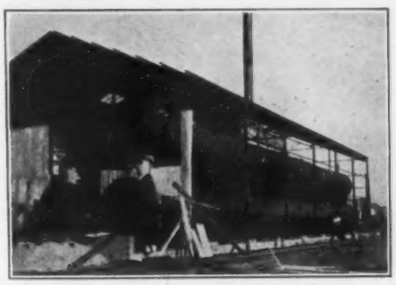


Fig. 5. Vacuum cylinders, fitted with doors at each end.

the entire cylinder with air under a pressure of from 50 to 125 lb. This air permeates the wood. The cylinder then is filled with creosote oil having a temperature of approximately 200 deg. F.; this is accomplished without releasing the air pressure. The condition then exists of the wood full of air under pressure surrounded by the hot creosote oil. More oil is forced into the cylinder under pressures of from 150 to 300 lb. depending on the type of machinery, until such amount has been injected as will leave 8 lb. per cu.ft. in the wood after release of pressure and the subsequent vacuum.

The preliminary air pressure then forces the surplus or loose oil out of the poles and leaves them dry and clean. While before the use of high air-pressures many of the poles were objectionable to linemen, the modern "empty cell" pole is so different and

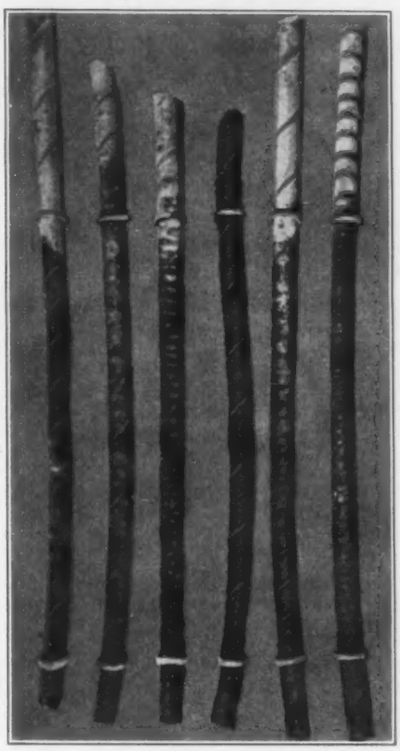


Fig. 6. Test borings taken from treated poles to show penetration of treatment; about two-thirds actual size.

so lacking in these disagreeable features that there is no objection made on the part of linemen. The chief engineer of one large power company using 25,000 poles per year recently stated that any objection on the part of their field forces had disappeared entirely.

After treatment the cylinder load or charge is run out of the cylinder on rails and is ready for shipment. Each load as it is removed from the cylinder is tested by an increment borer similar to a diamond core drill. These borings indicate the depth of penetration, Fig. 6, and are a most important check on the results secured.

The desideratum in wood preservation is the complete penetration of all of the sapwood and as much of the heartwood as is possible; material so penetrated cannot be improved upon. The borings taken after treatment indicate just how nearly these results have been secured and if for any reason they have not been secured the entire load is retreated. Upon completion of treatment a monogrammed dating nail is driven into each pole serving to give a definite check on pole life.

Through tests on the strength of pine poles engineers of one of the largest telephone companies in the United States have found it possible to use much smaller sizes than formerly were considered necessary. Smaller pine poles are equal in strength to the larger poles of other species of wood. One public-utility company in the Chicago district has for three years used nothing but creosoted pine poles, and its requirements for 1926 will total more than 55,000 pine poles.

It probably is impossible for the engineer to estimate accurately in advance the total costs of pole lines which are subject to attacks of decay, insects and storms of any kind. Some of the items to be considered are original costs, framing, peeling or scraping, application of preservative to the butt of the pole, transportation to the site, erection, replacement, return of damaged pole to concentration point for possible salvage, purchase of new pole at probably higher prices, interruption of service, depletion of forests through waste, to say nothing of W.O.M. (worry of mind).

Experience has shown that pine poles properly prepared can be depended on to give a useful life of well above 30 years. The use of 899,401 creosoted pine poles during 1924 as compared with 451,852 in 1923, an increase of 99 per cent in one year, is weighty evidence of the fact that their very great merit is appreciated by those who buy for service.

## Acoustic Shock Absorbers Help Telephone Operators*

By L. F. HUNT**, Development Engineer, Southern California Edison Company, Los Angeles

The Southern California Edison Company has a very extensive telephone system of its own. Many of the lines are long and follow transmission lines, in some cases on the same poles. Most of these lines terminate at the main office building where two positions are operated by two operators. These two operators handle all calls from the office to and from various substations and wear head sets continuously during their working hours. Whenever a flash-over occurs on a transmission line, the telephone lines running parallel to and near them pick up a very heavy discharge. If at the same time an operator happens to be using that particular line she will normally receive a very heavy acoustic shock through the receiver. A similar disturbance is caused by switches being out of adjustment, allowing one phase to open before the other; by switching telephone lines where they are closely inductively coupled with the transmission line; by ringing back over same telephone line, or other disturbances.

* Patent applied for.

** All rights reserved by the author.

Prevalence of acoustic shock from various causes and its undesirable effect upon the telephone operators caused an investigation to be made into the possible design of a simple apparatus to relieve the condition.

Since the acoustic shock is made by the diaphragm of the receiver hitting the pole pieces of the receiver, mechanical means first were tried to stop this action. The result was very unsatisfactory. Then it was decided that the only method which would be satisfactory was some saturating device in series with the receiver of the head set. Since a small saturating transformer would not be sufficient in itself the ordinary 3-element vacuum tube seemed to be the only solution. The vacuum tube has the characteristic curve as shown in Fig. 1; that is, the plate current will not increase over a given grid potential. Two devices were made using the ordinary audio-frequency radio transformer with the ordinary UV-199 detector amplifier tube. These were placed in series with the receiving circuit of the ordinary operator's head sets. Thus it took only two of these outfits for the two operators and to cover all the incoming private telephone lines.

Before the units were placed in service the operators kept the receiver away from their ears in anticipation of an acoustic shock. In spite of the precaution they were more or less seriously affected by an acoustic shock. However, during the past year and a half, since the installation of the units, the operators have suffered no bad effects from acoustic shocks, have full confidence in the device and operate with the receiver clasped tightly against their ears. In one instance an operator was instructing a student on one of the positions, the student using the protective device and the operator using an ordinary head set. An acoustic shock came over the line and the student heard only a click, while the operator received a shock from which it took her approximately an hour to recover.

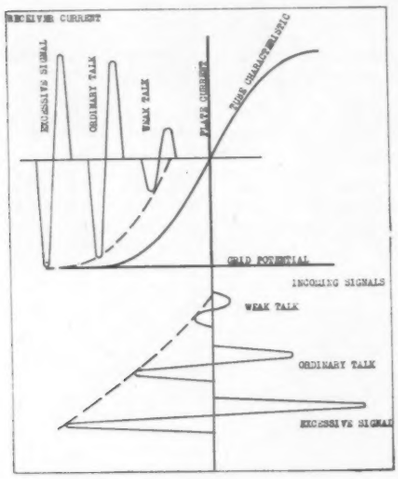



Fig. 1. Characteristic curve of the UV-199 tube used in the Southern California Edison Company's acoustic shock absorber for use on "high-line" phone exchanges. Ordinary talk variation is about from —8 to +8 volts. The equipment saturates at about +9 or —9 volts, thus eliminating signals of excessive values.

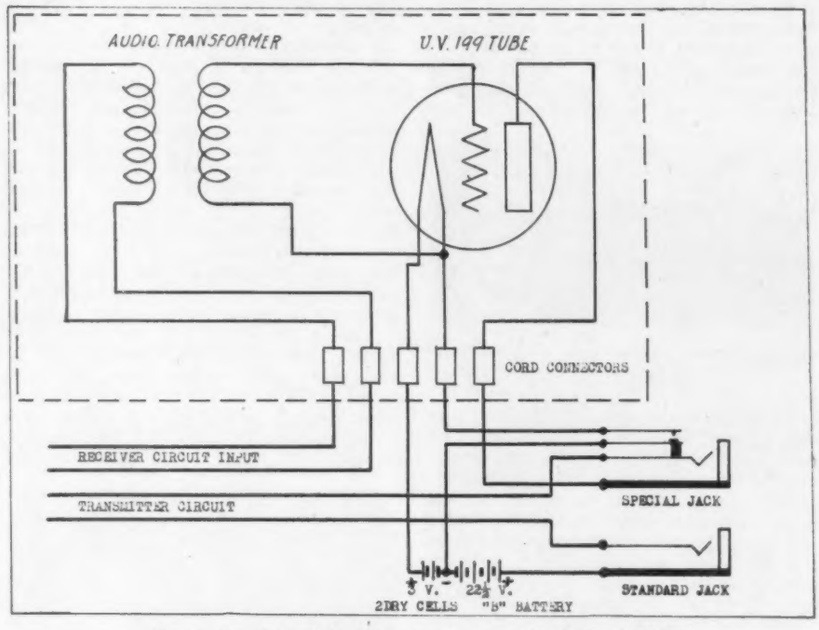



Fig. 2. Complete wiring diagram for acoustic shock absorber.

Fig. 2 is a complete wiring diagram of the unit as it is connected in a permanent manner on one of the positions.

The material used for the complete installation is as follows:

1 Dongan audio-frequency amplifying transformer.
1 U.V. 199 Radiotron tube.
1 Workrite U. V. 199 socket.
1 Special jack filament control
1 22½-volt B battery.
2 No. 6 dry cells.
5 No. 9 Western Electric cord connectors.
Miscellaneous materials, screws, wire, solder, bakelite base for mounting above, etc.

The Dongan transformer gave the best results of the many makes tried. The Workrite socket, having a very good shock-resisting base, proved satisfactory; outside jars and vibrations cause no disturbances. Flexible leads should be used for connection to the socket.

The socket, transformer and cord connectors are mounted on a small bakelite base. The outfit including batteries is placed in the lapboard of switchboards. Thus all connections are very short.

From the above it readily may be seen that ordinary radio apparatus is used throughout. Each tube has its separate battery so as not to complicate the units. The UV-199 tubes work very well on two dry cells direct, eliminating the necessity of a rheostat. It has been found that two dry cells will operate one tube for approximately three months, using them eight hours a day. The small-type B battery generally lasts about one year. The filament of the tube is energized through a special jack which closes contact when the telephone operator's head-set plug is inserted in the jack, thus making the filament control automatic.

The telephone department is installing these units on all positions where there is apt to be any acoustic shock of dangerous character.

## Gunite Process Places Tunnel Lining 30 In. Thick

A departure from common methods of tunnel-lining recently was brought to a successful completion on the Melones project of the Oakdale and South San Joaquin Irrigation District. To draw water from the lake to be created by the Melones dam on the Stanislaus River it was necessary to drive a 415-ft. tunnel through the adjacent solid rock.

The lining of this tunnel section was placed entirely by the Gunite process. Of itself this is no startling fact, but when it is considered that the thickness of the lining varied from 18 to 30 in. this method of deposition is of interest. As designed, the tunnel has a section 14 ft. 6 in. in diameter. Overbreak in the rock caused openings considerably in excess of this at many points, but not consistently enough to permit the tunnel section to be enlarged subsequently without still more excavation at several points. This fact accounts for the varying thickness and also for the unusual thickness. No reinforcement was used in the lining.

The total job required about 2,000

Fig. 1. Working up toward the crest of the arch

cu.yd. of concrete and required about 50 8-hr. shifts for placement. Due to the dryness of mix permitted by the Gunite process only light forms were required and it was necessary to leave these forms in place only about 48 hr. If the overbreak had not necessitated such an excessive thickness of lining the lining could have been

Fig. 2. Completed tunnel at entrance end; ellipse approximately 10x30 ft.

placed without any form other than a curved steel sheet right at the apex of the arch, and that only while the aggregate was being placed.

The Gunite process made use of a 1:4½ mix of materials mixed dry and conveyed through hose under air pressure to the depositing nozzle where the water was mixed in just as the materials left the nozzle. The process was extremely flexible. An single mixing station served about 200 ft. of tunnel from one location, through the flexible hoses, necessitating only infrequent movings. Air was supplied from a compressor station located at the tunnel entrance, 600 ft. from the gun.

In the particular job referred to above the tunnel-lining work was carried on by the Cement Gun Construction Company of California, under the general direction of E. H. Halloran, manager.

## Safe Primary Fuse Replacement Provided by Bracket

By A. S. GLASGOW, Assistant Superintendent Electric Transmission and Distribution, San Diego Consolidated Gas & Electric Company, San Diego.

Primary transformer cutouts sometimes break down and set crossarms afire. It has been the practice of the San Diego Consolidated Gas & Electric Company to effect emergency repairs in such cases by knocking the defective apparatus off the crossarm, making a solid tap by means of a screw connector. This rough measure would permit service to be maintained until a new cutout could be installed.

Since a defective transformer may provide a direct path from phase-wire to ground, the above-mentioned method of repair presented hazards to the troubleman. In making the temporary connection to bridge the gap left by the bad-order cutout he would be in danger even though the other side of the transformer were open.

To guard against such contingencies a number of special brackets were made up. Details of these holders are shown in Fig. 1; method of application in Fig. 2. The two arms of the device that grip the top of the crossarm are fitted with points which bite into the wood. These points are formed by drilling the arms, screwing pointed studs through to the desired depth and then cutting the studs off flush with the outside of the arm. The thumbscrew also is pointed and is fitted with a washer to prevent too deep penetration. No tools are required to mount the bracket.

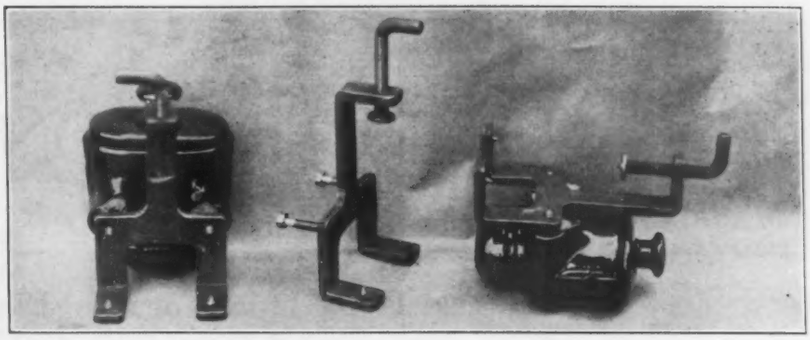


Fig. 1. Special safety bracket; method of mounting primary cutout.

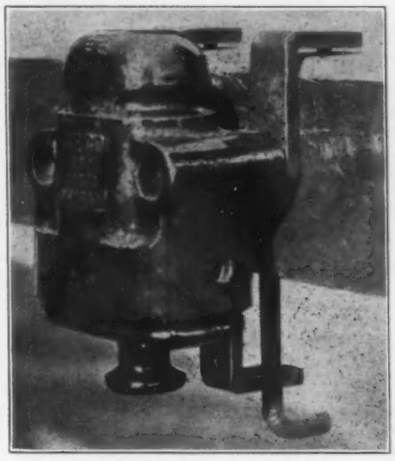


Fig. 2. Special bracket attached to crossarm.

Each troubleman carries two of these devices in his car. When a defective cutout is found it is removed from the arm in any safe manner that may be necessary and the special holder bracket installed in its place. Later, when permanent repairs are effected, the emergency device is returned to the troubleman.

## Numerical Switch Designation Aids Dispatchers

By W. C. FOSTER, Assistant Operating Engineer, Portland Electric Power Company

A system of designation has been worked out for the various lines of the Portland Electric Power Company. This system makes use of numbers for all lines whose voltage is 4.5 kv. or above, including arc circuits. Names are used for lines of less than the above voltage, including railway feeders and the 250-volt d.c. feeders. Since both 33 and 60-cycle lines prevail it is necessary that the number designation completely identify the line in question as well as to give its voltage and frequency. In the cases of the 11, 33 and 57-kv. lines the first two digits in the line number tell the voltage, the third digit indicates the frequency and the last two the individual line number. For example, line No. 11,631 would be 11-kv., 60-cycle line No. 31; and line No. 33,303 would be 33-kv., 33-cycle line No. 03. This system has been in use for several years and has proved to be entirely satisfactory.

The numbering system has been applied to switches with similar satisfaction. Pole-top switches are numbered consecutively, beginning with the first switch in the line. A metal tag on the pole bears the number of the switch and the number of the line which the switch controls. This helps materially in emergencies when it may be necessary to send someone to operate a certain switch with which he may not be familiar. Stations have been assigned blocks of numbers consisting of not less than three numerals. Even numbers are assigned to oil switches and odd numbers to air switches. All of these numbers are marked on or adjacent to the apparatus to which it applies and also is noted in its proper place on the dispatcher's diagram.

The system of number designation was adopted for several reasons: names were considered to be too lengthy in giving switching orders over the telephone and in making logbook entries; with numbers there is less liability of misunderstanding between dispatcher and operator; with numbers an operator is less liable to open the wrong switch. The general use of three consecutive numbers for line switch, oil switch and bus switch on any line is a great help in checking switches. For instance, if the operator reports switches 1,861, 1,862, 1,863 open on a certain line the dispatcher knows at once that the line switch, oil switch and bus switches are open on that line. A break in number rotation in reporting immediately will give rise to a question.

**A 40,000-kva., 25-60 cycle frequency changer** is being built by the Westinghouse Electric & Manufacturing Company for the Commonwealth Edison Company of Chicago. This is the largest machine of this character ever to be attempted up to the present time. The machine will be used to tie together the two branches of the company's system. Some of the refinements will include a motor-operated frame-rotating device, direct-connected induction starting motor, and two direct-connected exciters.

# IDEAS FOR THE CONTRACTOR

## Electrical Work Reported as Two Per Cent of Building Cost

The electric work represents only two per cent of the cost of construction work, according to a survey made by the United States Department of Labor. This is the smallest of any of the items included in the report.

The proportionate divisions, including labor and materials, are as follows:

| | |
|---|---|
| Foundations and masonry | $ 36.10 |
| Carpentry | 29.10 |
| Plumbing | 10.00 |
| Heating | 8.70 |
| Hardware—metals | 7.60 |
| Painting | 6.50 |
| Electric, including fixtures | 2.00 |
| | $100.00 |

These figures present an indictment against electrical men. They represent an opportunity to contractors and others in the electrical industry to sell more electrical wiring in order to bring this up to a reasonable figure of at least six per cent, three per cent for wiring and three per cent for fixtures.

**Mary Briant, motion picture actress, just after she tacked the Red Seal poster on the first Red Seal home in Los Angeles, which was built for J. M. Close. W. F. Brainerd, California Electrical Bureau, is looking the poster over carefully. A. S. Tyler, electragist who installed the wiring, is standing in the doorway with Miss Briant.**

## Cross Index for the Electrical Safety Orders—II

### Cross-Reference Tables for Use with the Orders Issued by the Industrial Accident Commission of California

A cross-index for the Electrical Safety Orders of the Industrial Accident Commission of California has been prepared by E. Earl Browne, manager of the San Francisco Association of Electrical Contractors and Dealers. This will be an aid to contractors, inspectors and others in the industry, for under any heading all of the references to that particular subject may be found. The final installment is presented herewith.

| Subject | Order | Parts of other orders dealing with the same subject |
|---|---|---|
| MOTORS, MOTOR CONTROL EQUIPMENT, AND MOTOR WIRING—711 | | |
| Voltage Limitation | 711- 1(a) | 717-4(a). |
| Terminating Metal Conduit at Motors and Control Equipment | 711- 2(b) | 711-4; 711-5(d). |
| Wiring Between Resistors and Controllers | 711- 2(c) | 717-1(b); 717-4(d). |
| Control Circuits | 711- 2(d) | 702-1(a); 711-9(a)1. |
| Conduit Required | 711- 4(a) | 703-9(a); 711-2(b); (Note). |
| Minimum Size of Conductors Carrying Current of One Motor | 711-5(a) | 711-6(g). |
| Demand Factor | 711- 5(c) | 702-1(r). |
| Size of Conductors in Secondary Circuits of Slip Ring Motors | 711- 5(d) | 702-1(a); 711-2(b); (Note); 711-5(k); 711-5(j); (Note); 711-6(j). |
| Size of Conductors to Resistors Used with Direct Current Motors | 711- 5(e) | 711-2(b). |
| Circuit Breakers or Fuses Protecting Motor Feeders and Branch Circuits | 711- 5(g) | 702-1(p); 711-6(c); 711-6(a). |
| Branch Circuits for Certain Alternating Current Motors | 711- 5(j) | 711-5(d)3. |
| Exception Applying to Certain Two-Speed Varying-Speed Motors | 711- 5(k) | 711-5(d); 711-6(k); 711-15(c). |
| Cutout Required | 711- 6(a) | 711-6(i); (Note); 711-5(g); 711-6(e). |
| Mechanical Operating Devices | 711- 6(d) | 711-14(b); 717-2(i). |
| Fuses in Mutiple | 711- 6(e) | 711-5(g); 711-6(a). |
| Individual Starting Overload Cutouts—When Required | 711- 6(g) | 711-5(a); (Note). |
| Grouping Motors Under One Set of Fuses | 711- 6(i) | 711-6(a)2; 717-2(e); 711-6(a). |
| Overload Cutouts-Motors of Short-Time Rating and Motors Used for Duty-Cycle Work | 711- 6(j) | 711-5(d)3. |
| Exception Applying to Certain Two-Speed Motors | 711- 6(k) | 711-6(a)3 |
| Grounding Motors and Control Equipment | 711- 8 | 704-4. |
| Grounding Noncurrent-Carrying Metal Parts | 711- 8(a) | 703-11(f); 708-1(b); 708-1(i); 702-1(x). |
| Switches for Disconnection | 711- 9(a) | 711-2(d); 711-9(d); 717-4(g); 711-2(d); 709-3(e); 717-2(e); 717-2(b). |
| Location of Starting Switches and Starters | 711- 9(c) | 711-12(a)3. |
| Working Space About Motors and Control Equipment | 711-10(a) | 710-2(d); 711-12(a)2; 712-2(e); 713-1(c). |
| Protection from Mechanical Injury and Deteriorating Agencies | 711-11(b) | 713-8. |
| Steps and Handrails | 711-11(d) | 712-2(d). |
| General Requirements—Enclosure, Guarding, Isolation | 711-12(a) | 711-9(c). |
| Remote Control Equipment—Additional Requirements | 711-12(c) | 709-2(f); 711-8(a); (Except. 2); 711-14(f). |
| Protection from Mechanical Injury and Deteriorating Agencies | 711-12(d) | 713-8. |
| Enclosing Arcing or Sparking Parts—Explosives, Highly Inflammable Gases, etc. | 711-13(a) | 713-8(d); 713-4(f). |
| Enclosing Arcing or Sparking Parts—Inflammable or Explosive Dust | 711-13(b) | 713-8(Note). |
| Mechanical Operating Devices | 711-14(b) | 711-6(d); 717-2(i). |
| Over-Speed Protection | 711-14(c) | 712-2(b). |
| Emergency Stop Device | 711-14(e) | 712-2(c); 717-2(i). |
| Warning Signs at Automatically Controlled Machines | 711-14(f) | 711-12(c). |
| Overload Protection—Wound-Rotor and Direct Current Motors | 711-15(c) | 711-5(k). |

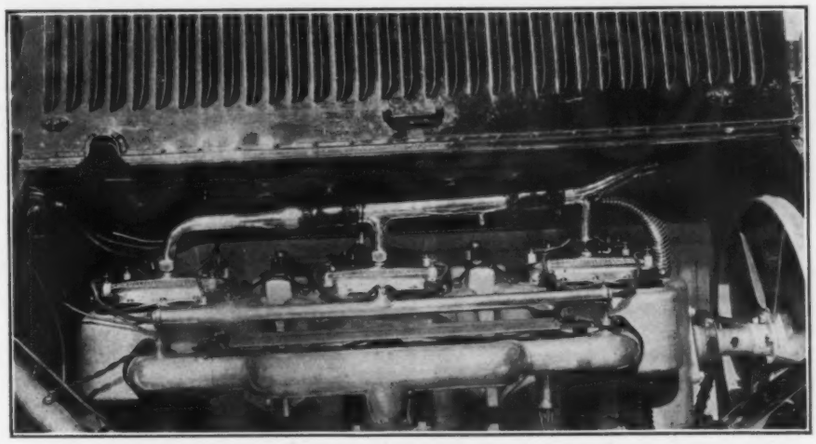
| Subject | Order | Parts of other orders dealing with the same subject |
|---|---|---|
| **GENERATORS AND ROTARY CONVERTERS—712** | | |
| Direct Current Generators | 712- 1(a) | 713-4(f). |
| Speed-Limiting Devices for Motors Driving Generators and Rotary Converters | 712- 2(b) | 711-14(e). |
| Emergency Stopping Devices | 712- 2(c) | 711-14(e). |
| Steps, Handrails and Ladders | 712- 2(d) | 711-11(d). |
| Working Space and Guarding | 712- 2(e) | 711-10(a). |
| **MISCELLANEOUS ELECTRICAL INSTALLATIONS—713** | | |
| Workspace and Guarding | 713- 1(c) | 711-10(a). |
| Insulating Mats | 713- 1(e) | 708-1(i). |
| Portable Cords | 713- 4(b) | 713-8(c); 702-1(x). |
| Elevation of Switches, Cutouts and Receptacles | 713- 4(d) | 717-4(j). |
| Type of Motors and Generators Required | 713- 4(f) | 712-1(a); 711-13(a). |
| Wires in the Vicinity of Tanks | 713- 5(d) | 713-8(b). |
| Electrical Equipment Operating Under Abnormal Conditions | 713- 8 | 711-13(b). |
| Location and Protection of Equipment | 713- 8(a) | 711-11(b). |
| Insulation of Conductors Exposed to Deteriorating Agencies | 713- 8(b) | 711-12(d); 713-5(d). |
| Portables and Pendants in Hazardous Locations | 713- 8(c) | 713-4(b). |
| **HEATING DEVICES AND APPLIANCES —714** | | |
| Cutouts | 714- 1(b) | 702-1(h). |
| Voltage Limitations | 714- 1(e) | 702-1(j). |
| Transformers | 714- 2(d) | 705-2(b)4. |
| Guarding Exposed Live Parts | 714- 2(h) | 709-2(f). |
| **THEATRES, MOVING PICTURE ESTABLISHMENTS AND MOVING PICTURE STUDIOS —715** | | |
| Working Space | 715- 2(b) | 710-2(b); 710-2(c); 715-2(e). |
| **SIGNS—716** | | |
| General Requirements | 716- 1(a) | 703-11(d). |
| **ELECTRIC ELEVATORS AND ELECTRIC HAULAGE EQUIPMENT—717** | | |
| Conductors | 717- 1(b) | 711-2(c). |
| Crane Motors | 717- 2(e) | 711-6(l); 711-9(a)5. |
| Controllers and Resistors | 717- 2(i) | 711-6(d); 711-14(b). |
| Limit Switches | 717- 2(j) | 711-14(e). |
| Voltage Limitations | 717- 4(a) | 711-1(a); 702-1(g). |
| Wires Between Motors and Controllers | 717- 4(d) | 711-2(c)2. |
| Flexible Conductors | 717- 4(f) | 702-1(x). |
| Switch for Disconnecting Motor and Control Equipment | 717- 4(g) | See No. 334-o Elev. Orders. |
| Metal Cases Required for Limit Switches, etc. | 717- 4(j) | 713-4(d). |

## Strip-Heaters Installed on Fire Apparatus to Warm Manifolds

Strip-heaters have been installed on all fire apparatus, the police patrol and city ambulance in Fresno, Calif. By this means the motors are always warm and will start instantly and will run without backfiring.

The heaters are mounted on the manifolds and are connected to a male convenience outlet on the dashboard or other convenient location, by slow-burning wire. The female half of the convenience outlet is connected to the connecting extension cord in order that it may be dropped to the floor without shorting. The receptacle is prevented from breaking by means of a rubber disk with a hole in it. With this protection it may be dropped to the floor without damage.

Most of the heaters are 500-watt, 110-volt Westinghouse strip-heaters. Fresno has been one of the most progressive cities in the matter of electrification of its fire houses. A number of the old houses have been remodeled and made all-electric; all new houses are built with electric air-heaters installed in the offices and rooms, and an electric range is installed in each kitchen.



Electric strip-heater installed on manifold of fire engine to keep it warm and ready to start at all times.

## Questions and Answers on the Code and Safety Orders

**Arrangements have been made with Claude W. Mitchell, electrical engineer of the Board of Fire Underwriters of the Pacific, to answer through the columns of the Journal of Electricity such questions on the National Electrical Code as are of general interest.**

**Similar arrangements have been made with George E. Kimball, electrical engineer of the Industrial Accident Commission of the State of California, to answer questions on the Electrical Safety Orders issued by the Commission.**

**While it is the object of this department to assist in a better understanding of the Code and the Safety Orders, replies given are not to be considered as official interpretations applying in all instances, as some of the rules permit of varying interpretations under different conditions. The questioner should be guided by the inspection department having jurisdiction.**

**All who are interested are invited to send in their inquiries regarding the National Electrical Code to Claude W. Mitchell, Board of Fire Underwriters of the Pacific, Merchants Exchange Building, San Francisco, Calif., or to the Editor, Journal of Electricity, 883 Mission Street, San Francisco. Questions on the Safety Orders should be sent to George E. Kimball, Industrial Accident Commission, State Building, Civic Center, San Francisco, or to the Editor.**

**Q. 10. Does it require larger conductors for a 10-hp. 220-volt 3-phase motor which is started by throwing it directly on the line without a starting compensator than it would if a compensator was used?**

A. Under ordinary conditions, with a starting compensator to reduce the line voltage, No. 6 and No. 8 wire would be used as shown in Table 711-15 (k). Without the starting compensator larger wire and fuses would be required, [See Order 711-15 (d)]. Without the compensator and a normal run of but a few feet from the distribution switch to the motor No. 4 should be large enough. The setting of the motor running overload protection would remain at 35 amp. regardless of the size of the circuit conductors.

**Q. 11. Is low-voltage protection required with the starting switch for a 5-hp. motor connected by a short belt to a shaft driving a group of sewing machines? The belt is housed completely and the shaft is guarded.**

A. No. In the revision of the Electrical Safety Orders the requirement for low-voltage protection was modified. The General Safety Orders of the Industrial Accident Commission require that exposed belts, pulleys and shafting be properly enclosed or guarded. When such guarding is provided on sewing machine equipment, there is little danger of an employee being injured through the sudden restarting of the motor after a failure of power. Low-voltage protection usually would be required by Electrical Safety Order 711-14 (a) if the motor was driving more than one shaft with other equipment connected.

# Electrical Estimating for the Contractor — X

## Proper Grouping of Machines and Layout of Plant Important Considerations when Using Line-Shaft Drive

By J. R. WILSON,* Engineering Department, Los Angeles Electric Works.

Valuable information pertaining to line shafting is given in Tables 7, 8 and 9. On every line-shaft set-up the apparent size of suitable shaft as given in Table 7 always should be checked against the computation obtained from Chart 1. The size obtained from the chart is the size to use for best results.

After the maximum demand has been determined the next step is to determine the proper grouping of the machines. Whether to use a single line shaft with the machines all in one row, or to use several groups of machines, each group driven by a separate group shaft (and all in turn driven from the main shaft) can be determined only by the available floor space, the operating conditions and the customer's preference.

The practice of splitting the load up into several groups and driving each group by a separate motor is ideal, especially if the group loads can be divided about evenly. In that case the motors can all be of the same size, and by having one spare motor on hand loss of time due to burn-outs is reduced to a minimum. This would result in a material reduction in the cost of the line-shaft equipment and also in the erection cost. The approximate saving probably would amount to between 30 per cent and 40 per cent. The four small motors would cost about twice as much as one large motor.

In advising an owner on the selection of motors for line-shaft drive, an effort should be made to induce him to provide a certain "over capacity." It is the general rule that additional machines always are connected to available line shafts. A plant manager may comb the market for all the latest machines adapted to his business and may purchase what is rated as a strictly up-to-the-minute layout of machinery. Inside of a year a new machine designed to revolutionize a certain step in his scheme of operation may appear on the market. If the machine has enough merit he will want to purchase it and add it to his present layout.

It is of course impracticable to foresee and provide for every contingency of this nature that may arise, nor would it be good business to advise a manager to purchase motors of much larger capacity than necessary for his present load, but if the load indicates a 5-hp. motor the investment in a 7½-hp very likely would be justified. So with a 15-hp. to handle a 10-hp. load, or a 20-hp. to handle a 15-hp. load. This especially holds true with the new type of high-resistor motors where starting compensators are not necessary. By a careful selection of line-shaft speeds and arrangement of the line shafts it is sometimes possible to dispense with the purchase of a spare motor by having a small over-capacity on each of the active motors. A layout of this kind is shown in Fig. 2 and the caption explains the set-up.

Due to lack of personal experience some estimators are prone always to tell a prospective customer, "Individual motor drive is the modern and logical set-up to use in your plant." In the case of special machinery or conditions this may very well be true, but in the majority of plants the manufactured article represents a series of operations which are progressive from the raw material to the finished product. With this fact in mind it may readily be seen that a large extra investment in individual motors and wiring always does not represent real economy.

The fallacy that individual motor drive will fit every manufacturing condition is based upon several wrong conceptions of the troubles that are supposed to be inherent to line-shaft drives. Lack of flexibility of possible operation is one of the chief arguments put forth against line-shaft drive. "If it is desired to perform only one operation or to run only one machine, it is necessary to drive all the line shafts to do so." Very true, but if this condition arises only as an occasional emergency, which could not have been foreseen and provided for, it is not in itself a true argument against line-shaft drive. In a series of manufacturing operations it is necessary so to time the movements of the product from one machine to another that there will be no lost motion.

*All rights reserved by the author.

### Table 7

## Horse-Power of Shafting

The following tables are compiled from these well-known formulæ:

Formula No. 1: H. P. = $D^3 R \div 125$ Formula No. 3: H. P. = $D^3 R \div 75$

Formula No. 2: H. P. = $D^3 R \div 90$ Formula No. 4: H. P. = $D^3 R \div 50$

D = Diameter of Shaft. R = Revolutions Per Minute.

Formula No. 1 is used for extra heavy work on shafts acting as prime movers or main head shafts carrying main driving pulley, sheave or gear, well supported by bearings.

Formula No. 2 is used for regular line shafts carrying pulleys, gears, etc., with bearings every eight feet.

Formula No. 3 is used for line shafts doing medium work, carrying pulleys, gears, etc., of moderate size, with bearings every eight feet.

Formula No. 4 is used for line shafts doing light work, simply transmitting power, with bearings every eight or ten feet.

| Diameter of Shaft—Inches | NUMBER OF REVOLUTIONS PER MINUTE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 300 | 350 | 400 | 450 |
| 1⅞ Formula 1 | .0238 | 1.19 | 1.78 | 2.38 | 2.97 | 3.56 | 4.16 | 4.76 | 5.33 | 5.95 | 7.14 | 8.33 | 9.52 | 10.91 |
| 1⅞ Formula 2 | .0330 | 1.65 | 2.48 | 3.30 | 4.13 | 4.95 | 5.78 | 6.60 | 7.43 | 8.25 | 9.90 | 11.55 | 13.20 | 14.85 |
| 1⅞ Formula 3 | .0396 | 1.98 | 2.97 | 3.96 | 4.95 | 5.94 | 6.93 | 7.92 | 8.91 | 9.90 | 11.88 | 13.86 | 15.84 | 17.82 |
| 1⅞ Formula 4 | .0594 | 2.97 | 4.46 | 5.94 | 7.43 | 8.91 | 10.40 | 11.88 | 13.37 | 14.85 | 17.82 | 20.79 | 23.76 | 26.73 |
| 1¹⅛ Formula 1 | .0384 | 1.92 | 2.88 | 3.84 | 4.80 | 5.76 | 6.72 | 7.68 | 8.64 | 9.60 | 11.52 | 13.44 | 15.36 | 17.28 |
| 1¹⅛ Formula 2 | .0533 | 2.67 | 4.00 | 5.33 | 6.67 | 8.00 | 9.33 | 10.66 | 12.00 | 13.35 | 15.99 | 18.69 | 21.36 | 24.03 |
| 1¹⅛ Formula 3 | .0641 | 3.20 | 4.81 | 6.41 | 8.01 | 9.61 | 11.21 | 12.81 | 14.41 | 16.02 | 19.22 | 22.42 | 25.63 | 28.83 |
| 1¹⅛ Formula 4 | .0961 | 4.81 | 7.21 | 9.61 | 12.01 | 14.42 | 16.82 | 19.22 | 21.62 | 24.03 | 28.83 | 33.64 | 38.44 | 43.25 |
| 1¼ Formula 1 | .0582 | 2.91 | 4.36 | 5.82 | 7.27 | 8.73 | 10.18 | 11.64 | 13.09 | 14.55 | 17.46 | 20.36 | 23.27 | 26.18 |
| 1¼ Formula 2 | .0808 | 4.04 | 6.06 | 8.08 | 10.10 | 12.12 | 14.14 | 16.16 | 18.18 | 20.20 | 24.24 | 28.28 | 32.32 | 36.36 |
| 1¼ Formula 3 | .0970 | 4.85 | 7.27 | 9.70 | 12.12 | 14.55 | 16.97 | 19.39 | 21.82 | 24.24 | 29.09 | 33.94 | 38.79 | 43.64 |
| 1¼ Formula 4 | .1455 | 7.27 | 10.91 | 14.55 | 18.18 | 21.82 | 25.46 | 29.09 | 32.73 | 36.37 | 43.64 | 50.91 | 58.18 | 65.46 |
| 1⅜ Formula 1 | .0837 | 4.19 | 6.28 | 8.37 | 10.47 | 12.56 | 14.65 | 16.75 | 18.84 | 20.93 | 25.12 | 29.31 | 33.50 | 37.68 |
| 1⅜ Formula 2 | .1163 | 5.82 | 8.73 | 11.63 | 14.55 | 17.45 | 20.36 | 23.26 | 26.18 | 29.10 | 34.89 | 40.74 | 46.56 | 52.38 |
| 1⅜ Formula 3 | .1396 | 6.98 | 10.47 | 13.96 | 17.45 | 20.93 | 24.42 | 27.91 | 31.40 | 34.89 | 41.87 | 48.85 | 55.82 | 62.80 |
| 1⅜ Formula 4 | .2093 | 10.47 | 15.70 | 20.94 | 26.17 | 31.40 | 36.64 | 41.87 | 47.10 | 52.34 | 62.80 | 73.27 | 83.74 | 94.21 |
| 1⅞ Formula 1 | .1159 | 5.79 | 8.69 | 11.59 | 14.48 | 17.38 | 20.27 | 23.17 | 26.07 | 28.96 | 34.76 | 40.55 | 46.34 | 52.14 |
| 1⅞ Formula 2 | .1609 | 8.05 | 12.08 | 16.09 | 20.13 | 24.14 | 28.17 | 32.18 | 36.12 | 40.25 | 48.27 | 56.35 | 64.36 | 72.45 |
| 1⅞ Formula 3 | .1931 | 9.65 | 14.48 | 19.31 | 24.14 | 28.96 | 33.79 | 38.62 | 43.44 | 48.27 | 57.93 | 67.58 | 77.24 | 86.89 |
| 1⅞ Formula 4 | .2896 | 14.48 | 21.72 | 28.96 | 36.21 | 43.45 | 50.69 | 57.93 | 65.17 | 72.41 | 86.89 | 101.40 | 115.90 | 130.30 |
| 2⅛ Formula 1 | .1553 | 7.76 | 11.65 | 15.53 | 19.41 | 23.29 | 27.17 | 31.06 | 34.94 | 38.82 | 46.59 | 54.35 | 62.11 | 69.88 |
| 2⅛ Formula 2 | .2157 | 10.79 | 16.19 | 21.57 | 26.98 | 32.36 | 37.76 | 43.14 | 48.55 | 53.95 | 64.71 | 75.53 | 86.28 | 97.11 |
| 2⅛ Formula 3 | .2588 | 12.94 | 19.41 | 25.88 | 32.35 | 38.82 | 45.29 | 51.76 | 58.23 | 64.70 | 77.64 | 90.58 | 103.50 | 116.50 |
| 2⅛ Formula 4 | .3882 | 19.41 | 29.12 | 38.82 | 48.53 | 58.23 | 67.94 | 77.64 | 87.35 | 97.05 | 116.50 | 135.90 | 155.30 | 174.70 |
| 2⅜ Formula 1 | .2028 | 10.14 | 15.21 | 20.28 | 25.35 | 30.42 | 35.49 | 40.56 | 45.63 | 50.69 | 60 83 | 70.97 | 81.11 | 91.25 |
| 2⅜ Formula 2 | .2816 | 14.08 | 21.12 | 28.16 | 35.20 | 42.24 | 49.28 | 56.32 | 63.36 | 70.40 | 84.48 | 98.56 | 112.60 | 126.72 |
| 2⅜ Formula 3 | .3380 | 16.90 | 25.35 | 33.80 | 42.25 | 50.69 | 59.14 | 67.59 | 76.04 | 84.49 | 101.40 | 118.30 | 135.20 | 152.00 |
| 2⅜ Formula 4 | .5069 | 25.35 | 38.02 | 50.69 | 63.37 | 76.04 | 88.71 | 101.40 | 114.10 | 126.73 | 152.10 | 177.40 | 202.80 | 228.10 |
| 2⅞ Formula 1 | .2591 | 12.95 | 19.43 | 25.91 | 32.39 | 38.86 | 45.34 | 51.82 | 58.29 | 64.77 | 77.72 | 90.68 | 103.63 | 116.59 |
| 2⅞ Formula 2 | .3598 | 17.99 | 26.99 | 35.98 | 44.98 | 53.97 | 62.97 | 71.96 | 80.96 | 89.95 | 107.94 | 125.93 | 143.92 | 161.91 |
| 2⅞ Formula 3 | .4318 | 21.59 | 32.39 | 43.18 | 53.98 | 64.77 | 75.57 | 86.36 | 97.16 | 108.00 | 129.50 | 151.10 | 172.70 | 194.30 |
| 2⅞ Formula 4 | .6477 | 32.39 | 48.58 | 64.77 | 80.96 | 97.15 | 113.30 | 129.50 | 145.70 | 161.90 | 194.30 | 226.70 | 259.10 | 291.50 |
| 3⅛ Formula 1 | .3249 | 16.25 | 24.37 | 32.50 | 40.62 | 48.74 | 56.86 | 64.99 | 73.11 | 81.24 | 97.48 | 113.73 | 129.98 | 146.22 |
| 3⅛ Formula 2 | .4513 | 22.57 | 33.86 | 45.13 | 56.43 | 67.70 | 78.99 | 90.26 | 101.56 | 112.85 | 135.39 | 157.99 | 180.52 | 203.13 |
| 3⅛ Formula 3 | .5416 | 27.08 | 40.62 | 54.16 | 67.70 | 81.23 | 94.77 | 108.30 | 121.90 | 135.40 | 162.50 | 189.50 | 216.60 | 243.70 |
| 3⅛ Formula 4 | .8123 | 40.62 | 60.93 | 81.24 | 101.50 | 121.90 | 142.20 | 162.50 | 182.80 | 203.10 | 243.70 | 284.30 | 324.90 | 365.60 |
| 3⅜ Formula 1 | .4011 | 20.06 | 30.08 | 40.11 | 50.14 | 60.17 | 70.19 | 80.22 | 90.25 | 100.28 | 120.34 | 140.39 | 160.45 | 180.50 |
| 3⅜ Formula 2 | .5571 | 27.85 | 41.77 | 55.71 | 69.62 | 83.55 | 97.48 | 111.42 | 125.33 | 139.25 | 167.13 | 194.95 | 222.84 | 250.65 |
| 3⅜ Formula 3 | .6685 | 33.43 | 50.13 | 66.85 | 83.56 | 100.30 | 117.00 | 133.70 | 150.40 | 167.10 | 200.50 | 234.00 | 267.40 | 300.80 |
| 3⅜ Formula 4 | 1.0028 | 50.14 | 75.21 | 100.30 | 125.40 | 150.40 | 175.50 | 200.60 | 225.60 | 250.70 | 300.80 | 351.00 | 401.10 | 451.30 |
| 3⅞ Formula 1 | .4883 | 24.42 | 36.63 | 48.83 | 61.04 | 73.25 | 85.46 | 97.67 | 109.88 | 122.09 | 146.50 | 170.92 | 195.34 | 219.75 |
| 3⅞ Formula 2 | .6783 | 33.91 | 50.86 | 67.83 | 84.77 | 101.72 | 118.69 | 135.66 | 152.60 | 169.55 | 203.49 | 237.37 | 271.32 | 305.19 |
| 3⅞ Formula 3 | .8139 | 40.70 | 61.04 | 81.39 | 101.70 | 122.10 | 142.40 | 162.80 | 183.10 | 203.50 | 244.20 | 284.90 | 325.60 | 366.30 |
| 3⅞ Formula 4 | 1.2208 | 61.04 | 91.56 | 122.10 | 152.60 | 183.10 | 213.60 | 244.20 | 274.70 | 305.20 | 366.20 | 427.30 | 488.30 | 549.40 |
| 4⅛ Formula 1 | .6990 | 34.95 | 52.43 | 69.90 | 87.38 | 104.85 | 122.33 | 139.81 | 157.28 | 174.76 | 209.70 | 244.66 | 279.61 | 314.56 |
| 4⅛ Formula 2 | .9709 | 48.54 | 72.81 | 97.09 | 121.35 | 145.62 | 169.90 | 194.18 | 218.44 | 242.70 | 291.27 | 339.78 | 388.36 | 436.86 |
| 4⅛ Formula 3 | 1.1650 | 58.25 | 87.38 | 116.50 | 145.60 | 174.80 | 203.90 | 233.00 | 262.01 | 291.30 | 349.50 | 407.80 | 466.00 | 524.30 |
| 4⅛ Formula 4 | 1.7476 | 87.38 | 131.10 | 174.80 | 218.50 | 262.10 | 305.80 | 349.50 | 393.20 | 436.90 | 524.30 | 611.70 | 699.00 | 786.40 |
| 4⅜ Formula 1 | .9629 | 48.15 | 72.22 | 96.29 | 120.37 | 144.44 | 168.51 | 192.59 | 216.66 | 240.73 | 288.88 | 337.03 | 385.17 | 433.32 |
| 4⅜ Formula 2 | 1.3372 | 66.86 | 100.29 | 133.72 | 167.15 | 200.58 | 234.01 | 267.44 | 300.87 | 334.30 | 401.16 | 468.02 | 534.88 | 601.74 |
| 4⅜ Formula 3 | 1.6048 | 80.24 | 120.40 | 160.50 | 200.60 | 240.70 | 280.80 | 321.00 | 361.00 | 401.20 | 481.40 | 561.70 | 641.90 | 722.16 |
| 4⅜ Formula 4 | 2.4073 | 120.40 | 180.50 | 240.70 | 300.90 | 361.10 | 421.30 | 481.50 | 541.60 | 601.80 | 722.20 | 842.60 | 962.90 | 1083.6 |
| 4⅞ Formula 1 | 1.3310 | 66.55 | 99.83 | 133.10 | 166.38 | 199.65 | 232.93 | 266.20 | 299.48 | 332.75 | 399.30 | 465.85 | 532.40 | 598.95 |
| 4⅞ Formula 2 | 1.8483 | 92.42 | 138.63 | 184.80 | 231.05 | 277.22 | 323.43 | 369.60 | 415.85 | 462.10 | 554.40 | 646.94 | 739.20 | 831.78 |
| 4⅞ Formula 3 | 2.2183 | 110.90 | 166.40 | 221.80 | 277.30 | 332.70 | 388.20 | 443.70 | 499.10 | 554.60 | 665.50 | 776.40 | 887.20 | 998.10 |
| 4⅞ Formula 4 | 3.3275 | 166.40 | 249.60 | 332.80 | 415.90 | 499.10 | 582.30 | 665.50 | 748.70 | 831.90 | 998.20 | 1165.0 | 1331.2 | 1497.6 |
| 6 Formula 1 | 1.7280 | 86.40 | 129.60 | 172.80 | 216.00 | 259.20 | 302.40 | 345.60 | 388.80 | 432.00 | 518.40 | 604.80 | 691.20 | 777.60 |
| 6 Formula 2 | 2.4000 | 120.00 | 180.00 | 240.00 | 300.00 | 360.00 | 420.20 | 480.00 | 540.00 | 600.00 | 720.00 | 840.00 | 960.00 | 1080.0 |
| 6 Formula 3 | 2.8800 | 144.00 | 216.00 | 288.00 | 360.00 | 432.00 | 504.00 | 576.00 | 648.00 | 720.00 | 864.00 | 1008.0 | 1152.0 | 1296.0 |
| 6 Formula 4 | 4.3200 | 216.00 | 324.00 | 432.00 | 540.00 | 648.00 | 756.00 | 864.00 | 972.00 | 1080.0 | 1296.0 | 1512.0 | 1728.0 | 1944.0 |

To find H.-P. at speeds not given in table multiply the horse-power at one revolution per minute by the desired speed.

In making a plant layout too little thought sometimes is given to the nature of the product and the operations necessary to produce the finished article. Where a certain operation for special reasons must be performed apart from the regular series, an individual motor for that machine may be the only logical answer. Where a plant makes a number of different articles on which the market demand depends upon seasonal requirements, individual motor drive or a series of group drives may prove to be the correct layout.

**TABLE NO. 8.**

Comparative Weights of Finished Steel Shafting.

| Diam. in. | Wt. Per ft. | Diam. in. | Wt. Per ft. |
|---|---|---|---|
| 15/16 | 2.35 | 2 15/16 | 23.06 |
| 1 | 2.68 | 3 3/16 | 27.16 |
| 1 3/16 | 3.77 | 3 7/16 | 31.58 |
| 1 7/16 | 5.52 | 3 11/16 | 36.40 |
| 1 11/16 | 7.61 | 3 15/16 | 41.40 |
| 1 15/16 | 10.03 | 4 3/16 | 46.83 |
| 2 | 10.69 | 4 7/16 | 52.60 |
| 2 3/16 | 12.80 | 4 11/16 | 58.67 |
| 2 7/16 | 15.89 | 4 15/16 | 65.50 |
| 2 11/16 | 19.31 | 5 3/16 | 71.86 |

A plant manager in seeking products to add to his regular line must give a great deal of thought not only to the investment required in new machinery but also to the way the contemplated product will fit into his present plant operations. An apparently large "paper profit" may prove to be a loss if the new product should turn out to be a misfit. On the other hand, a new product taken on at a very small margin of profit may show a double gain if it serves as a "stop gap" for a previous loss.

These statements serve to stress the fact that a great many factors must be considered before advising a customer as to the proper driving equipment for his plant. Each plant is a problem in itself and should be given a great deal of thought in order that an economically efficient layout may be given for the money expended.

After the plant layout has been decided upon the next step is to determine the speed at which the shaft or shafts will run. Very seldom it will be possible to select a line-shaft speed that will fit every machine so that all may be connected direct to the line shaft. It will be necessary to select a speed that will accommodate the majority of machines with use of standard pulleys.

The present-day tendency toward operating machines at maximum capacity, thereby lowering production cost, has raised the recognized standard of line-shaft speeds above former ratings. The speed of a line shaft determines the hp. transmitted and the highest practicable speed for the particular installation will be the one to use. Use of ball or roller-bearing hangers will permit the use of high speeds on line shafts. The present-day standards for machine-shop main drives is 250 to 350 r.p.m. On woodworking machinery a higher speed is much more desirable and a speed between 400 and 600 r.p.m. should be used. With high-speed line shafts it is possible to use lower belt tension, smaller pulleys and narrower belts. This will reduce the installation cost and will permit higher belt speed.

The next step is the proper location of the motor or motors. In Fig. 2 the motors are shown as being so located as to drive to the center of the line shafts. While this location may appear ideal it is not always the most desirable set-up to use. The location of the driving motor should be determined by the previously mentioned maximum demand and the location and type of the machines creating this demand. A machine demanding considerable hp. should be thrown, if possible, on the line shaft in a slow and gradual manner. A heavy machine which is thrown abruptly onto the line shaft has a tendency to create distortion in the shaft due to "shock load."

This distortion places an added strain (above normal) upon the hangers and also upon the motor. So we see that just dividing the hp. demand by 2 and placing the motor at the center of the shaft will not do in all cases. In the case of large punch presses, cut-off shears, and rolls, even if provided with heavy fly-wheels, the demand on the line shaft at the instant of doing greatest work must be taken into account. Referring to Fig. 2 the machinery set-up might be such as to indicate the location of each motor at an entirely different point.

**Table 9**

## Standard Sizes of Key Seats

FOR PULLEYS, GEARS, SHEAVES, SPROCKETS, CLUTCHES, ETC.
STANDARD TAPER KEYS ¼-INCH PER FOOT

| Diameter of Shaft | Size of Key Inches | Key seat in Hub | | Key seat in Shaft | |
|---|---|---|---|---|---|
| | | Width Inches | Depth Inches | Width Inches | Depth Inches |
| ¼ to 1 11/16 inches | 1/4 x 3/16 | 1/4 | 1/8 | 1/4 | 1/16 |
| 1 5/16 to 1 3/4 inches | 3/8 x 9/32 | 3/8 | 3/16 | 3/8 | 3/32 |
| 1 13/16 to 2 1/4 inches | 1/2 x 1/4 | 1/2 | 1/4 | 1/2 | 1/4 |
| 2 5/16 to 2 3/4 inches | 5/8 x 15/32 | 5/8 | 5/16 | 5/8 | 5/32 |
| 2 13/16 to 3 1/4 inches | 3/4 x 9/16 | 3/4 | 3/8 | 3/4 | 9/16 |
| 3 5/16 to 3 3/4 inches | 7/8 x 21/32 | 7/8 | 7/16 | 7/8 | 7/32 |
| 3 13/16 to 4 1/4 inches | 1 x 3/4 | 1 | 1/2 | 1 | 1/4 |
| 4 5/16 to 4 3/4 inches | 1 1/4 x 21/32 | 1 1/4 | 9/16 | 1 1/4 | 9/32 |
| 4 13/16 to 5 1/4 inches | 1 1/4 x 15/16 | 1 1/4 | 3/8 | 1 1/4 | 5/16 |
| 5 5/16 to 5 3/4 inches | 1 1/2 x 1 1/32 | 1 1/2 | 11/16 | 1 1/2 | 11/32 |
| 5 13/16 to 6 1/4 inches | 1 1/2 x 1 1/2 | 1 1/2 | 3/4 | 1 1/2 | 3/8 |
| 6 5/16 to 6 13/16 inches | 1 1/2 x 1 7/32 | 1 1/2 | 13/16 | 1 1/2 | 13/32 |
| 6 7/8 to 7 1/4 inches | 1 1/2 x 1 5/16 | 1 1/2 | 7/8 | 1 1/2 | 7/16 |
| 7 5/16 to 8 1/4 inches | 2 x 1 1/2 | 2 | 1 | 2 | 1/2 |
| 8 5/16 to 9 1/4 inches | 2 1/4 x 1 1/2 | 2 1/4 | 1 | 2 1/4 | 1/2 |
| 9 5/16 to 10 1/4 inches | 2 1/2 x 1 1/2 | 2 1/2 | 1 | 2 1/2 | 1/2 |
| 10 5/16 to 11 1/4 inches | 2 3/4 x 1 1/2 | 2 3/4 | 1 | 2 3/4 | 1/2 |

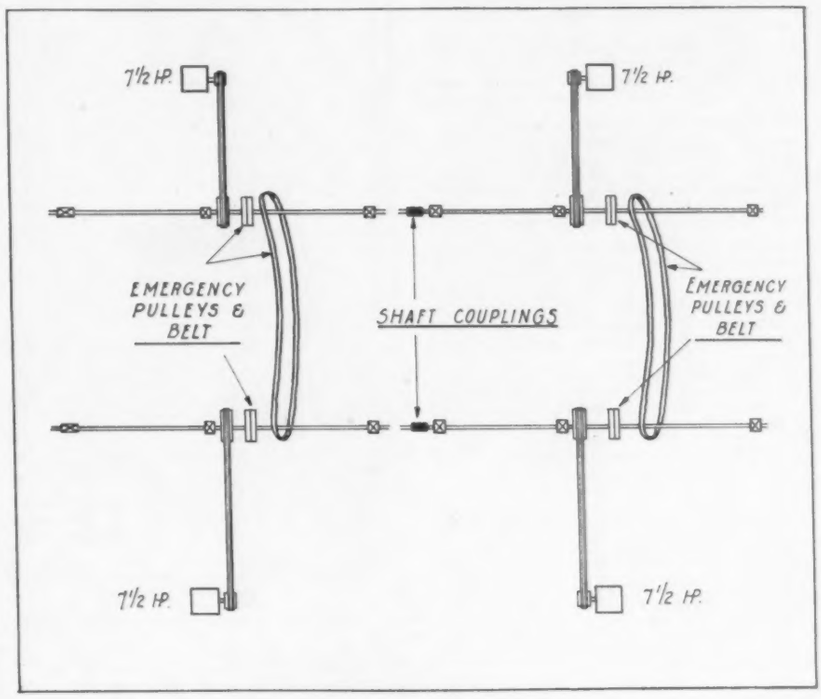



Fig. 2.—Layout of line shafting provided with emergency pulleys and belts. Normal load on each shaft of 5 hp.; the line shaft speeds are all alike. In case of a breakdown one motor carries the two shafts. Such an arrangement gives a maximum of protection and provides for a minimum loss of production. By aid of shaft couplings and emergency belts any two departments may be operated by any motor.

# BETTER MERCHANDISING

## Don't Overlook the Groom

### In June-Bride Sales Activity the Groom Is Almost as Important as the Bride—Start Him Right

In all this talk about June brides there has been very little said about that necessary accompaniment to every wedding, the June bridegroom. Of course, he does not receive many of the wedding presents, as a rule, but does he not furnish the home and is his happiness not tied up with the domestic success and content of his bride? There is a distinct message to him in the electrical story—why not tell it to him?

The Electrical Service League of British Columbia does not hesitate in answering this question. Already it has included the bridgegroom in its program of reaching the public. No sooner has the announcement of the engagement appeared in the apper than the happy gentleman receives this heart-to-heart talk from the secretary of the league:

The Electrical Service League of British Columbia extends to you sincerest congratulations on your approaching wedding and, being mostly benedicts themselves, are presumptuous enough to offer a few suggestions which they have found ensure continuous smooth running of the new home.

1. Provide labor-saving appliances and eliminate manual labor as much as possible.
2. Make cooking pleasant and easy by good lighting and even temperature in the kitchen.
3. Provide electric outlets for portable and standard lamps to permit the good lady to exercise her artistic taste in furnishing.
4. Provide outlets in the bedrooms and boudoir for reading lamp, curling iron, hair dryer, etc.
5. Provide outlets in hall for vacuum cleaner.

Remember that the latter portion of the day is expected to be given to social duties, and it adds wonderfully to the happiness if all the household affairs can be attended to in the morning without worry and over-exertion. Have everything done electrically. It is clean, it is a great time and worry-saver, and it is not expensive.

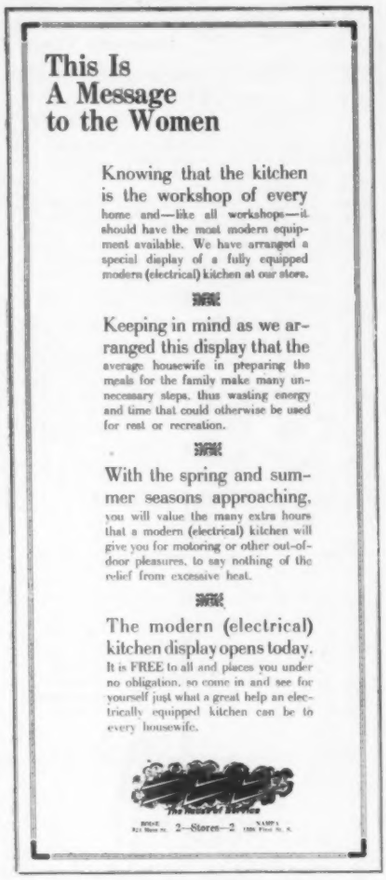
If you are renting a home, be sure it has provision for the above modern conveniences, and if you are buying or building a home the enclosed pamphlet shows plainly the conveniences a modern home should have.

Again wishing you every happiness,

Yours faithfully,

The bride, in the meantime, has not been overlooked. It is to be supposed that her wishes will be consulted in determining the proper wiring and household equipment to be installed in the new home. She therefore receives the following communication, also from the Electrical Service League:

The Electrical Service League of B.C. extends to you its sincerest good wishes for a long and happy future, and in doing so takes also the liberty of making a few suggestions on modern home equipment which will materially assist towards that end:


This Is
A Message
to the Women
Knowing that the kitchen is the workshop of every home and—like all workshops—it should have the most modern equipment available. We have arranged a special display of a fully equipped modern (electrical) kitchen at our store.
Keeping in mind as we arranged this display that the average housewife in preparing the meals for the family make many unnecessary steps, thus wasting energy and time that could otherwise be used for rest or recreation.
With the spring and summer seasons approaching, you will value the many extra hours that a modern (electrical) kitchen will give you for motoring or other out-of-door pleasures, to say nothing of the relief from excessive heat.
The modern (electrical) kitchen display opens today.
It is FREE to all and places you under no obligation, so come in and see for yourself just what a great help an electrically equipped kitchen can be to every housewife.
2—Stores—2

Advertising pays Roy Walker, of Boise, Idaho, for it helps him to put his store to the front and attract business in the "best sold" district in the country. This advertisement brought people to his model electric kitchen in numbers.

1. Have everything possible electric. It is clean——a great labor- and worry-saver, and is inexpensive.
2. Make sure your new home, whether rented, purchased or built, is equipped with convenience outlets for use of electrical appliances.

If you observe those two cardinal principles at the beginning, housework rapidly becomes a simple matter of routine and allows all the time necessary for social functions and social duties.

Electricity is the modern electric servant. It works quickly and efficiently, requires no training, and is always there when wanted.

The enclosed pamphlet shows very plainly and simply the wiring and outlets requisite for lighting and use of household appliances in a home today.

Again wishing you every happiness, we are,

Yours very truly,

The young couple thus are approached at a propitious moment. If they are counting on building a home —and many of them are—the message of adequate wiring and outlets finds an immediate response. If they are merely renting, their attention is directed at least, toward the selection of an electrically equipped apartment. In any case, the way is prepared for the later sale of washing machine, electric range, vacuum cleaner and other household aids which make for domestic happiness and comfort. What is more, the idea of an electrical home is presented to them at a time when a home seems a very precious and radiant thing. Unconsciously it becomes an ideal which, if it cannot be realized at the moment, is one of the things to be attained later on.

The fact that this letter is, in fact, taken seriously is shown by the responses which have been received, not only from brides, but from the grooms as well.

---

### Model Kitchen Attracts Throngs to Boise Electric Store

A model electric kitchen, built in one of the show rooms in the store, was one of the novel means used by the Walker Electric Company of Boise, Idaho, to interest housewives in up-to-date electrical equipment for the workshop of the home. During the first week this display was arranged, over 1,000 people viewed the electric kitchen, and several thousand more housewives inspected this modern equipment during the remainder of the exhibit.

Advertising featuring this display consisted of a direct-by-mail invitation to the women of Boise, followed by a series of four letters mailed at regular intervals. In addition, a quarter-page advertisement in the leading newspapers was run every other day for a period of sixty days. By following a similar newspaper campaign during the month of December last year this store increased its December business nearly $4,000 over the same month of the previous year.

Mr. Roy Walker, manager of the Walker Electric Company, is one of the leading merchandisers of the state of Idaho. He is a firm believer in advertising, and because of the quantity and quality of his advertisements, together with proper merchandising methods, he is able to sell a large amount of electrical merchandise in a

territory where a central station sells more merchandise per residential customer than any other in the United States.

Mr. Walker recently has opened up another store in Nampa, Idaho.

## Manufacturers' Representative Speaks on Range Sales

Meeting as the guests of Listenwalter & Gough, Inc., at the Elite, Los Angeles, on the evening of March 12 more than three hundred electrical dealers, contractors and central-station representatives enjoyed a splendid dinner and excellent talks on the subject of the electric range and its rapidly growing universality.

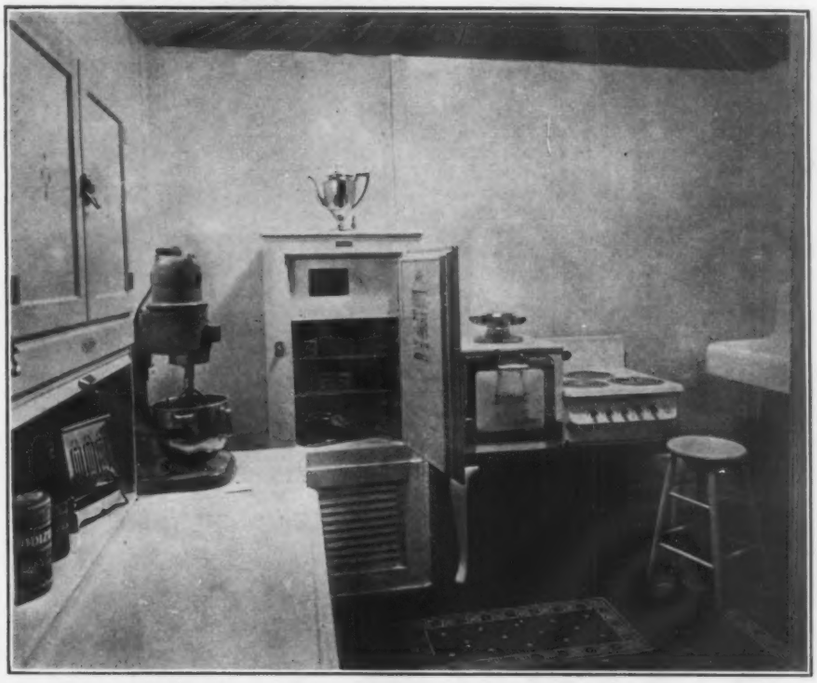
This meeting was the culmination of a series of six which the company has held in the interests of better merchandising policies and methods for its customers.

Harry Lippert, representing the A. J. Lindemann & Hoverson Company, manufacturers of the "L & H Electric" ranges, discussed the sales policy adopted by the Pacific Gas and Electric Company and the Great Western Power Company in central and northern California, where, with the co-operation and active help of those power companies, the electrical dealers and leading merchants in the section were encouraged to promote actively the sale of electric ranges.

In touching upon the subject of the sale of electric ranges to women, Mr. Lippert pointed out that the design of the morern range has been made so simple and practical that an immediate appeal is made. "Selling electric ranges to the fairer sex," went on Mr. Lippert, "has outgrown the technical, slide-rule method of selling, and in outfitting a woman's modern kitchen it is only necessary to show her an attractively designed range which will harmonize with her white or French-gray kitchen, and one which easily is kept spic and span."

Elbert Kramer, manager of the electric range and heating appliance department of Listenwalter & Gough, in a very interesting discussion pointed ing electric ranges is no longer in the category of specialty salesmanship but has taken upon itself all the dignity of real merchandising and has opened up possibilities of profit-making which would have been unbelievable under the old regime. Mr. Kramer took occasion to thank the district managers of the Southern California Edison Company and their co-workers for their splendid co-operation which had made possible the success of this series of meetings.

**Electragists Report Kilowatt Increases Due to Appliance Sales.**—The February report of the California Electragists, Southern Division, on kilowatts represented by the appliances sold by them during the month shows that 205 kw. of load was added to the power-company lines through the merchandising of the Electragists for that month. Of this 205 kw. the toasters for which the combined campaign was staged brought 89 kw. A total of 160 toasters was reported sold in the unified campaign.



Just because the central station in his territory sells more merchandise per residential consumer than anywhere in the United States, is Roy Walker of Boise, Idaho, downhearted? Not at all. With this excellent model electrical kitchen he attracts crowds to his store and sells them still more appliances.

# California Best Market for Washing Machines

## Manufacturer of Washers on Visit Compliments State but Says Northwest Lags in Washer Sales Efforts

California and the western states offer the best market in the United States to the manufacturer of washing machines, according to Harry L. Barker, president and general manager of The Meadows Manufacturing Company, of Bloomington, Ill., who was a recent San Francisco visitor.

"I have been out here more than a score of times," said Mr. Barker, "and each trip convinces me more thoroughly of the tremendous market advantages you have over the East and Middle West.

"True, you have a very few large merchants in the washing machine business and they enjoy what to some seems tremendous volume. However, I predict for them a very greatly increased business, notwithstanding the inevitable entry of large competitors into the field.

"The washing-machine business has had its share of unscrupulous merchants, as have other lines, and the generous profits have attracted some whose practices and policies have done the industry no good. However, the retailing of electric domestic washers has come to be recognized as so staple, permanent, sound and profitable a business, that it has attracted capital investments equal to that employed in the retailing of motor cars. Two or three of your Pacific Coast retailers have investments approaching the million mark. When one considers that probably no single appliance in the home is so universally necessary, or effects so great a saving of time, physical labor and money, it is not strange that the marketing of washers should be very profitable when done with ample capital and experienced executive guidance.

"Nowhere in this country are new homes being established at the rate you are growing out here. Nowhere is there the same preponderance of individual homes, as contrasted to the flat and apartment of the East. In these two factors alone you have a big advantage.

"Your population increases are amazing to anyone unfamiliar with the delights of living here. It is my determination to make California my home in the not too distant future. It has surprised me that the large washing-machine marketing organizations of California have not been duplicated in the Northwest where I am confident equal opportunities exist. That's a great country up there. They have the money, the homes, the up-to date spirit—everything to attract a large washer organization such as you have in California.

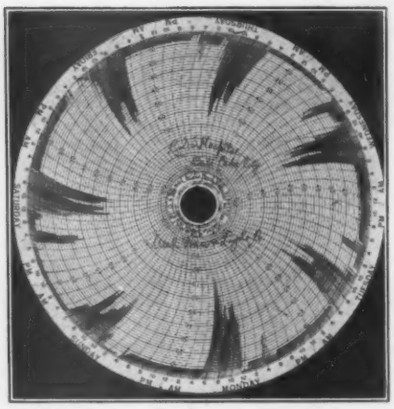
"The difference is that the washing-machine business has been merchandised in California and as good a job has been done as any place in the United States, but the same cannot be said of the Northwest. In my opinion the Northwest has done a rather poor job on washing machines.

"The failure of the central stations on the Coast to recognize the value to them in washer merchandising is also puzzling to me. The fallacy that because the washer is in itself a very small current-consumer it possesses little revenue potentiality has been exploded in the East and as far West as Utah. We have figures, drawn very accurately from the rec-

ords of power companies, showing average increases in current consumption of as high as 50 per cent in groups of homes taken at random, for corresponding periods before and after the sale of electric washers. Investigations made to determine the reason for this increase in the face of the low rating of the motors reveal the fact that the advent of the washer revived or inaugurated the use of other electric appliances. Primarily, of course, the ironer follows the washer. This increased load is an off-peak load for the power company and the washer is a good-will builder second to no other appliance."

Mr. Barker, in discussing future tendencies in the business, expressed the belief that there would be combinations of manufacturers and concentration on fewer types, thus effecting economies which could be reflected in reduced prices to consumers.

That such a situation as is sometimes referred to as "the saturation point" presented any problem at all to the washing-machine industry was dismissed with a wave of the hand by Mr. Barker, who, as past president of The American Washing Machine Manufacturers' Association, has a keen insight into figures. "Increased demand created by population increase and discarding of old machines far outstrips production and probably will continue to do so indefinitely," said Mr. Barker.



Demand meter chart showing load distribution as practiced in the Latter Day Saints' Hospital.

## Electric Ranges Prove Efficient in Hospital Installation

Cleanliness, efficiency and economy are outstanding features in the successful operation of a hospital kitchen. The new Edison heavy-duty equipment which was installed recently in the Latter Day Saints' Hospital in Salt Lake City, Utah, is accomplishing remarkable results along this line. This institution now is using two hotel-type ranges, one baking and roasting oven, one 120-loaf bake oven, and a sixteen-slice toaster.

During the month of February of this year the hospital was crowded to capacity, serving 36,000 meals, with a connected load of 67½ kw. and a demand of 35.4 kw. The average cost per meal amounted to .00334 cent, or 131 watts per patient. By placing the demand meter in plain sight of the chef, these results are being obtained. Off-peak hours are used to take care of the pastry baking, fat rendering, and maintaining temperature for the next morning's run, thereby reducing the peak by this operation about 30 per cent. The accompanying chart presents an interesting picture of the results that are being accomplished.

## Vancouver Claims Lowest Lighting Rates on Pacific Coast

Vancouver, B. C., claims to have the lowest domestic lighting rates on the Pacific Coast as the result of a reduction made on Jan. 1, 1926, by the British Columbia Electric Railway Company. The new rates are 4½ cents a kw.-hr. for the first three kw.-hr. per 100 sq. ft. of floor area and 2 cents for all current in addition. The former rate was 5 cents on the first step and 2 cents on the second. Corresponding reductions were made in suburban municipalities where the rate is now 5½ cents on the first step and 2 cents on the second. The former rate was 6 cents and 3 cents.

These rates were announced voluntarily, there being no public utility commission in the province of British Columbia.

In the city of Vancouver there have been five successive rate reductions since 1917. At that time the rate was 8.8 cents net plus a meter charge of 15 cents. Rates were dropped to 8 cents net, to 6 cents, to 5 cents and on Jan. 1 the floor-area basis was adopted providing for current at 2 cents after 3 kw.-hr. per 100 sq. ft. were used.

In one of the outlying municipalities now participating in the reduction the cost of current has been cut in two in two years.

Light Up!
Your Home deserves Better Lighting
LIGHT is now so cheap, that every home in Greater Vancouver should enjoy an abundance of warm, soft light.
Check over your lights today and see if your rooms are adequately lighted. Here is the standard used in the 1924 Home Lighting Contest:
Total Watts
Living room 250 - 500 watts
Dining room (table) 150 - 200 "
Dining room (walls) 50 - 200 "
Kitchen 150 - 250 "
Bedroom 175 - 300 "
Porch 50 - 100 "
Bathroom 1 0 - 175 "
Basement 200 - 300 "
Dining Room Fixture
Shade or diffuse every light.
Let no "raw" light strike the eye.
Remember that if you have a house of 1,000 square feet, you have to use only 30 kilowatt hours, costing $1.35 in Vancouver city and $1.65 in suburbs, before you get current at TWO CENTS A KILOWATT HOUR. Much of the light used on the above standard will be at the two-cent rate.
BRITISH COLUMBIA ELECTRIC RAILWAY CO.

Who would not use more light following so persuasive an invitation? The British Columbia Electric Railway Company attractively advertises its new low rates in order that it may gain greater kilowatt-hour consumption.

These general reductions, together with the adoption of the floor-area basis, are having the effect of increasing the average consumption. During the last few years this average has been going up approximately 10 per cent per annum, and efforts are being made to speed up this increase by advertising and other means.

The domestic-lighting reductions made by the company came on the heels of two other rate reductions, one for commercial lighting and the other for small power. These reductions likewise were made voluntarily.

## Postcards Prepare Way for Utah Company Salesmen

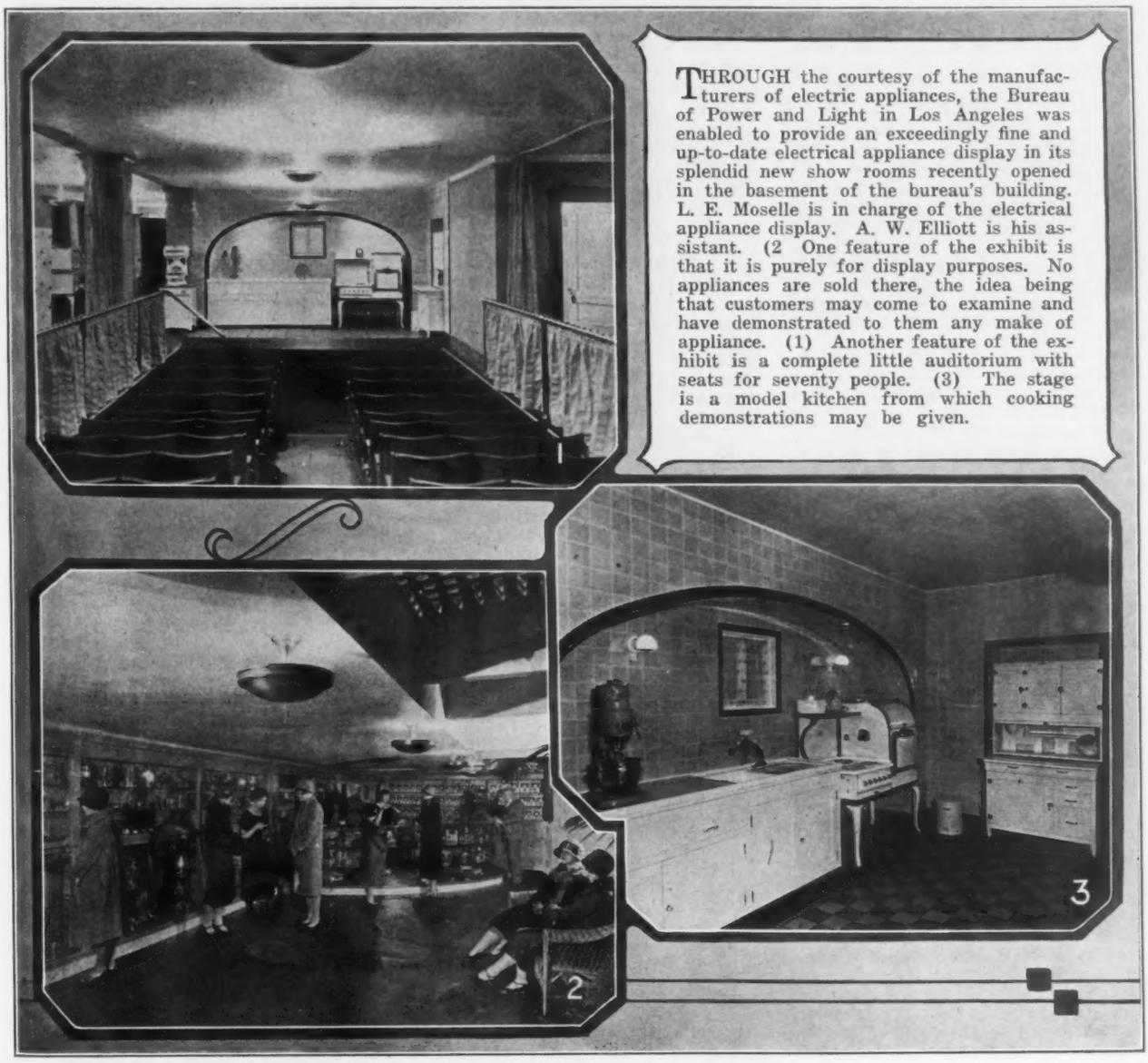
Postcards have a tradition. It is a tradition of reminding, for almost invariably a postcard is used to remind someone of one's self or of something. That it should be used to remind prospective buyers of the advantages to be derived from electric refrigeration is a modern application of the tradition. The Utah Power & Light Company in its refrigeration sales work this year has used this method effectively, according to word received from R. M. Bleak, superintendent of lighting and appliance sales of that company.

A series of sixteen postcards has been prepared by the company. One is sent twice a week to each prospect for electric refrigeration. The cards are mailed so as to reach the prospects on Tuesdays and Fridays of each week. On each card is concentrated in a terse statement one salient feature of electric refrigeration.

Among the points given individual emphasis in this way are: Saving of steps due to having refrigerator in the kitchen instead of on the porch; food preservation in relation to diet; a check to sickness in wholesome food; bacteria control; the housewife being subjected to exposure in going from warm kitchen to cold back porch avoided—a winter appeal; saving in foodstuffs; economies in buying; delicious drinks and appetizing desserts made; ice cubes at will; danger of food spoilage in winter as well as in summer; men should take interest in home equipment available; women take pride in ownership; winter use of refrigerator; economy both in food and operation cost; children need best in food, kept perfectly; beauty of electric refrigerator; and easy term payments available.

Here is an idea that may be used to advantage also in the merchandising of other electrical appliances.

**"Mr. Puget Power" Trade Character for Utility Company.**—A series of advertisements, in which "Mr. Puget Power," a trade character, is being utilized to convey the public utility's message to the public, has been started by the Puget Sound Power & Light Company, Seattle. The little trade character is depicted as a small, active, electric brownie, rushing from waterfalls to factory or home over electric wires. Messages printed under his auspices are typewritten, and quite personal in style, written in the first person.




THROUGH the courtesy of the manufacturers of electric appliances, the Bureau of Power and Light in Los Angeles was enabled to provide an exceedingly fine and up-to-date electrical appliance display in its splendid new show rooms recently opened in the basement of the bureau's building. L. E. Moselle is in charge of the electrical appliance display. A. W. Elliott is his assistant. (2 One feature of the exhibit is that it is purely for display purposes. No appliances are sold there, the idea being that customers may come to examine and have demonstrated to them any make of appliance. (1) Another feature of the exhibit is a complete little auditorium with seats for seventy people. (3) The stage is a model kitchen from which cooking demonstrations may be given.

# NEWS OF THE INDUSTRY

## Agricultural Engineers to Meet at Lake Tahoe June 23-26

Electricity in agriculture, reclamation, farm structures, farm power and machinery, and agricultural engineering research and extension will be the main subjects featured at the annual convention of the American Society of Agricultural Engineers to be held at Tahoe Tavern, Lake Tahoe, Calif., June 23-26.

The meeting will be followed by inspection trips beginning June 28 and extending through four days. While there will be opportunity on these inspection trips for observing many lines of agricultural engineering practice as carried on under California conditions, they will feature chiefly hydroelectric development and its utilization on the farm, irrigation, reclamation and drainage. Included in these trips will be an inspection of the hydroelectric and irrigation systems of the Pacific Gas and Electric Company in Placer County, including Lake Spalding, Drum power house, and the foothill orchard areas about Auburn and neighboring towns, and a drive by automobile through the Modesto and Turlock Irrigation Districts, where particular attention will be paid to irrigation, drainage by pumping, and farm electrification.

Arrangements for the meeting are in the hands of the Pacific Coast Section of the American Society of Agricultural Engineers.

All sesssions of the convention at Lake Tahoe will be open to those interested regardless of membership in the society. Those desiring or planning to attend should communicate with Prof. L. J. Fletcher, secretary of the Pacific Coast Section, University Farm, Davis. Headquarters of the convention at Tahoe will be at Tahoe Tavern where all sessions will be held.

## First-Aid Contest to Be Staged by Pacific Company

An innovation in the safety work conducted by the Pacific Power & Light Company, Portland, is to be instituted at Pasco, Wash., May 1, 1926, in the form of a contest in first-aid administration in which will compete eight 5-man teams representing different districts or groups of districts of the company. Problems based on the "Manual of First Aid for Miners," issued by the United States Bureau of Mines, will be offered for solution by the competing teams, the winner being given two trophies, one presented by the Sanderson Safety Supply Company, Seattle, for this year's contest, and one by the Pacific Power & Light Company to be competed for annually Judges are to be chosen from the fire departments of the cities of Wenatchee, Yakima and Walla Walla, and will be men versed in first-aid practice.

Competing teams are to be chosen locally by the districts from candidates showing the most aptitude in the first-aid studies which have been in progress among the personnel for some time. Instruction in first-aid practice has been a part of the accident-prevention program of G. I. Drennan, field superintendent, and in this phase of the work he has been assisted by H. H. Sanderson and Mr. Schoning of the Sanderson Safety Supply Company. These three men are arranging the details of the Pasco contest, which will be held on the lawn of the company's substation in that city on the above date.

Much interest both inside and outside of the company has been manifested in the coming event, and the company has invited to be present all those desiring to see the work. After the contest, which is scheduled for the morning, a picnic lunch will be served on the gounds for the contestants, spectators and guests.

## Contracts Let for Equipment for Melones Power Project

Hydraulic and electrical equipment for the Melones power project of the Oakdale and South San Joaquin Irrigation District in California will be furnished by the S. Morgan Smith Company and the Westinghouse Electric & Manufacturing Company, respectively, which have been awarded the contracts.

The hydraulic equipment includes two turbines rated at 18,500 hp. each, with an operating head of from 220 ft. maximum to 120 ft. minimum. The electrical equipment consists of two 13,500-kva., 6.6-kv. generators and four 9,000-kva. transformers rated at 6.6/110 kv. The Westinghouse company also will supply two 110-kv. oil circuit breakers and other miscellaneous electrical equipment.

For the present there will be one transmission line operating at 110 kv. from the Melones power house to Manteca where it will connect with the Pacific Gas and Electric Company system. Provision will be made for a second line to be erected when conditions warrant.

**Paper Company to Begin Construction of Power Project.**—The Washington Pulp & Paper Corporation, Port Angeles, Wash., announced that it will develop a hydroelectric power plant at Glines Canyon and will double the output of the company's newsprint mill in Port Angeles. It is planned to begin construction on the proposed power dam early in April, with 200 men employed. The power plant will develop 10,000 hp. The paper plant will add 150 employees to its payroll.

## Puget Sound Company Publishes Poultry Booklet

A recent constructive move in operating its agricultural extension service under the direction of J. C. Scott (Journal of Electricity, Feb. 1, 1926, p. 113), is found in the publication of Farm Bulletin No. 1 entitled, "The Baby Chick," by the Puget Sound Power & Light Company, Seattle. This is a 40-page, attractively printed and illustrated booklet in which is compiled by Mr. Scott a variety of information of interest to the poultry-raiser. Articles on raising and feeding chicks, and treating their ills are interspersed with articles explaining how to construct different kinds of yards and housing, and on the installation of suitable equipment. Contributors are George R. and Mrs. Shoup, poultry specialists, and J. W. Kalkus, veterinarian, Western Washington Experiment Station, Puyallup; J. S. Carver and L. W. Cassel, division of poultry husbandry, Washington State College, Pullman; and M. G. Cushing, Puget Sound Power & Light Company, Seattle.

A glance at the titles of the articles presented will give an idea of the scope of the bulletin. These are "Pedigreed Chicks;" "Baby Chicks;" "Chicken Rations';; Eradicating Bacillary White Diarrhea in Washington;" "Coccidiosis in Chickens;" "Equipment for Raising the Chick;" "Concrete Yards;" Stovepipe Brooders Have Merit;" "Pullet Development or Colony House;" "Perching Chicks Easily;" "Let Us Keep Our Livestock Comfortable;" and "Raising Chicks by Electricity." Each of the chapters is illustrated profusely with photographs and drawings, and bills of material are given in those instances in which are explained methods of construction. Wiring tables to show the size wire to use for circuits carrying a given load a certain distance, and the length and weight of resistance wire to use for given wattages, also are included.

The opportunity to circulate company advertising through the distribution of the bulletin is embraced by using the inside of the front cover and both sides of the back cover. One of these pages is devoted to a short but pertinent discussion of rural electrification, in which is brought out the relation of rural rates to a proper balance between conservative power development and economic power use. The other pages are given over to dignified and attractive advertisements, one for the company's preferred stock offering and the other for its electric service. The latter stresses the value to the farmer of employing the electric motor for all work possible so as to release his own energies for planning, organizing and directing the work of others.

## Oakland, Calif., to Survey for Power Sites on Mokelumne

The Chamber of Commerce of Oakland, Calif., has engaged Lester S. Ready, chief engineer of the California Railroad Commission, to conduct a survey of the upper Mokelumne River for sites suitable for developing power in connection with the proposed municipal water-supply project of the East Bay Municipal Utility District. The power developed would be used to help pay the cost of the water-supply project.

The East Bay Municipal Utility District is comprised of Oakland, Berkeley, Alameda, Piedmont, Richmond, San Leandro, Albany, Emeryville and El Cerrito. It plans to secure a domestic water supply by the erection of a dam on the Mokelumne River at Lancha Plana about 30 miles northeast of Stockton to impound the water and the construction of an aqueduct about 90 miles long from the dam to reservoirs now supplying the East Bay district. A bond issue of $39,000,000 was voted Nov. 4, 1924, to defray the cost of developing the first unit.

## Three Plans for Development of Sacramento Water Supply

Three plans for the development of a mountain water supply for the Municipal Utility District of Sacramento, Calif., from the Silver Creek drainage basin have been presented to the board of directors of the district.

Under plan No. 1 it is estimated that the cost for delivering 70,000,000 gallons of pure mountain water per day, which would be sufficient for a population of 250,000, would probably be $10,600,000. This plan does not provide for the installation of power houses along the aqueduct, but is the basic cost of water delivered to the district and would materially increase the present cost of water service in Sacramento.

Plan No. 2, which is estimated to cost $14,800,000, contemplates the development of power along the aqueduct at three lower stations. These would provide 14,200 hp. and would deliver 80,000,000 to 85,000,000 kw-hr. annually to substation terminals for the district. The revenue received from this power probably would not reduce the cost of water in Sacramento to its present level.

Plan No. 3 contemplates delivering 200,000,000 gallons of water per day into Sweetwater reservoir and 70,000,000 gallons from that point to Sacramento and would permit the generation of 91,534 continuous horsepower. The estimated cost of this project is $27,100,000, exclusive of an electrical distribution system. This installation would place 475,000,000 to 525,000,000 kw-hr. at the substation terminals. The engineers believe that if proper agreements can be made with power companies for the sale of this power, a pure mountain water supply could be delivered to Sacramento for approximately the present cost of water.

The consulting engineers on the project, William Mulholland, W. D. Mead, C. E. Grunsky and R. E. McDonnell, have requested definite information as to the possible revenue that may be derived from the sale of power that may be generated from the developed water supply of the district. The information is requested as a guide in their deliberations as to whether the district shall develop or distribute electric energy, or lease the use of this developed water to private companies, who would install the necessary power houses and appurtenant works for the development of power.

To obtain the necessary data the district board adopted a resolution appointing a committee of three members with authority to take the matter up with any and all power companies operating in the territory and to report back to the board with recommendations at the earliest possible time.

## Refrigerator Distributors of San Francisco Organize

At a meeting held in San Francisco at the Palace Hotel, April 13, attended by thirty-eight men vitally interested in the development of electric refrigeration in that territory, an organization was formed looking toward the development of the electric refrigeration market in northern California. Distributors of eight electric refrigerator manufacturers and of the three central stations serving the territory were in attendance.

The meeting was called at the request of J. Robert Crouse, the founder of the Electric Refrigeration Manufacturers Council, and vice-president of the Electric Refrigeration Corporation. Mr. Crouse explained the organization of distributors that has been formed in Cleveland and expressed the hope that a similar organization might be formed in San Francisco.

F. E. Hazard, chairman of the advertising committee of the Electric Refrigeration Manufacturers Council, and advertising manager of the Servel Corporation, told of the code of ethics that has been adopted by the Electric Refrigeration Manufacturers Council and of the aim of the advertising committee to sell electric refrigeration instead of any particular make of electric refrigerator.

A. K. Baylor of the General Electric Company presented an extremely interesting resume of the electrical refrigerator as it affected the housewife. Mr. Baylor also told of the benefit that accrued to the power company.

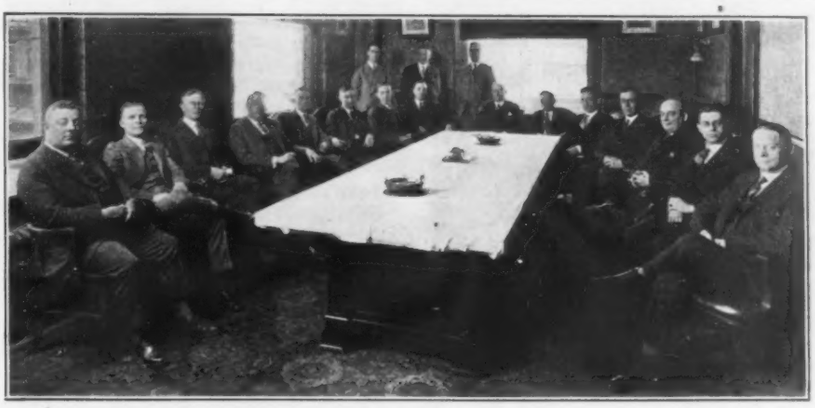
It was unanimously agreed that there was a need for a distributors' organization in San Francisco, this organization to work in co-operation with the California Electrical Bureau. R. E. Fisher, vice-president in charge of public relations and sales of the Pacific Gas and Electric Company, was elected chairman; F. H. Woodward, general sales manager of the Great Western Power Company, vice-chairman; and Victor W. Hartley, secretary of the California Electrical Bureau, was named secretary.

Mr. Fisher announced that it was his opinion that this organization should function in a state-wide capacity, operating in conjunction with the California Electrical Bureau, and the suggestion was accepted by the gathering.

## New Company to Serve Residents on Mountain Highway

To serve electric power and light to a number of small communities, farms, country homes, roadside garages, hotels and stores lying along and in the vicinity of the Mt. Hood Loop Highway in Clackamas County, Ore., the Loop Electric Corporation, Portland, has been formed by local people and with the following officers: George A. Curtis, president; U. E. Nelson, vice-president; F. K. Masters, secretary; C. M. Williams, treasurer; and J. W. Myers, additional director. The company will buy power at Sandy, Ore., from the Portland Electric Power Company and extend a three-phase, 11,000-volt main line from that point about twenty-five miles east to a point beyond Rhododendron in the Mt. Hood National Forest. Leading off from this line will be 6,600 and 2,300-volt laterals sufficient to reach all the business in the territory.

Financing will be effected in the main through the sale of preferred stock, much of which is expected to be subscribed by prospective customers. Some additional assistance in the construction of laterals is expected from prospective customers served by such laterals. Construction work on the main line has been started.



**Employees Public Relations Council of the Public Service Company of Colorado recently established to devise ways and means better to serve the public. (See Journal of Electricity, April 1, 1926, p. 258.) Sitting, left to right—O. L. Mackell, E. R. Johnson, J. A. Miller, G. B. Buck, Earl Johnson, Charles Sharland, Robert Kelly, T. J. West, Clare N. Stannard, vice-president and general manager; A. A. Klinge, William B. Walters, R. G. Munroe, C. A. Bigler, Earl P. Hodges, Charles H. Elliott. Standing—T. M. Foulk, Frank R. Jamison, R. G. Gentry, chairman of the council.**

# News Briefs

**Street Illumination of Everett, Wash., to Be Increased 53 Per Cent.**—The city of Everett, Wash., is to get a 53 per cent increase in illumination of its streets without added cost, due to the acceptance by the city of the contract with the Puget Sound Power & Light Company to furnish 1,133,000 units of light at street intersections for the next five years, instead of 739,000 furnished heretofore. Hundreds of street intersections will have double the present lights. The cost under the new contract will be $1,023.12 per month, a reduction of 28 cents from the old figure.

**Six U. S. C. Students to Be Trained at Schenectady Plant of General Electric Company.**—Six senior students from the University of Southern California have been chosen by the General Electric Company to be trained for positions of responsibility at the company's plant at Schenectady, N. Y., according to Philip S. Biegler, professor of electrical engineering at the university. Paul Churchill, Walter Scott, Charles Little, William Hogue, James Shidler and Burdette Ives are the senior students chosen.

**Two Applications to Federal Power Commission.**—The Oroville-Wyandotte Irrigation District has applied to the Federal Power Commission for a preliminary permit covering a power project on the South Fork of the Feather River in Butte and Plumas Counties, Calif. Two plans of development are proposed. Under the first plan there would be five power houses which would develop a maximum of 80,437 hp. Under the alternate plan there would be three power houses developing a total of 74,625 hp. The Tongass Power & Light Company, of Hyder, Alaska, has applied for preliminary permits, one on the Soule and the other on the Salmon River. Both are in the Tongass National Forest.

**Railroad Shops in Casper, Wyo., to Have Fuel Oil Electric Generating Plant.**—A fuel oil electric generating plant will be built by the Chicago, Burlington & Quincy Railroad at its shops in Casper, Wyo., according to an announcement of F. G. Gurley, general superintendent at Alliance, Neb. The estimated cost of the improvement is $80,000.

**Edison Company Starts Work on Huntington Park Substation.**—Work has been started on a new $150,000 substation to serve the Huntington Park territory of the Southern California Edison Company. This new station, which is to be 49 ft. by 79 ft. in outside dimensions, is to be located at the northeast corner of Rugby and Zoe Avenues, and will be built of reinforced concrete throughout. It is planned for an ultimate capacity of 18,000 kw. In keeping with the company's policy, the structure will be built to harmonize as closely as possible with its surroundings.

**San Diego Utility Applies for Permit to Issue Common Stock and Pay Common Stock as Dividend.**—The San Diego Consolidated Gas & Electric Company has applied to the California Railroad Commission for authority to issue and sell $2,000,000 par value of its common stock at par, and also for permission to pay dividends on its outstanding common stock in the shape of common stock of the proposed issue. In its application the company states that the proposed stock will be issued for the purpose of reimbursing itself for earnings previously diverted to uncapitalized construction expenditures and to refund money borrowed on promissory notes also for construction purposes.

**Irrigation District and Power Company in Conflict over Application for Water Permit.**—The Ojai Irrigation District, of California, has applied to the Federal Power Commission for a preliminary permit covering a 5,000-kw. project on Sespe Creek and the Ventura River in Ventura County, Calif. It is proposed to erect a dam 180 ft. high in Sespe Creek. The water would be carried 8.2 miles in a conduit to the power house. This application conflicts with that of the Ventura Power Company.

**Wyoming Utility Sold.**—The Hot Springs Light & Power Company of Thermopolis, Wyo., has been sold to the Monument Hill Electric Company, a recently incorporated company headed by R. J. Ireland of New York City. Mr. Ireland is president of the First National Bank of Thermopolis and of the Owl Creek Coal Company at Gebo, Wyo. The H. P. Rothwell interests also are associated in the new company. The sale was made by the Singer Securities Corporation. H. B. Morgan will continue as local manager. The new company has been granted a fifty-year franchise.

**Pacific Power & Light Company Plans Extensions and Improvements.**—The Pacific Power & Light Company, Portland, announces that a new power line to carry 6,600 volts will be built into the Prospect Point district in Walla Walla, Wash., in 1926, while a new loop circuit from the Walla Walla substation to the industrial district north and west to the penitentiary is in the company's plans for this fall. The company is expending about $65,000 in extensions to various parts of the city, and the year's expenditures will reach $100,000 for additions and improvements to its system.

**Portland Company Connects Newly Acquired Property to its System.**—With the completion of an 11,000-volt line approximately eight miles long from Scappoose to St. Helens, Ore., the Portland Electric Power Company, Portland, recently began to serve St. Helens from Portland. This property, formerly served from the local power plant of the St. Helens Lumber Company, was acquired last year by the Portland company (Journal of Electricity, Nov. 1, 1925, p. 353) with the expectation of extending a line to serve it from the existing system. The new line is constructed for operation at 66,000 volts but for the time being will be operated at 11,000 volts.

**Wynooche League States Objects.**—The Wynooche Water and Power League of Aberdeen, Wash., recently organized to promote the Wynooche water and power project development by the city of Aberdeen, has set forth its objects as follows: To secure the registration of all qualified voters; to secure submission to the qualified voters of a proposition to develop the power resources of the Wynooche by the people of Aberdeen as a municipal enterprise; to secure new enterprises by offering an abundance of cheap power and water as an inducement; to enter actively into any campaign which has for its purpose the development of water and power resources of the Wynooche River by the city. The life of the league is to continue until there actually has been constructed and in operation by the city of Aberdeen a municipally owned water and power system on the Wynooche River. Any person who is a qualified voter is eligible to membership.

**Preliminary Permit Granted for Power Project on Hat Creek, California.**—The Federal Power Commission has granted to the Red River Lumber Company of Minneapolis, Minn., a preliminary permit for eighteen months for a power project on Hat Creek, Shasta County, Calif. The project consists of a dam designed to divert 200 sec.-ft. of water through a flume to a power house about 3.4 miles from the dam. The power to be developed, estimated at 6,500 hp., will be used in manufacturing operations.

**Utility Files Protest Against Encroachment.**—A protest has been filed with the Arizona Corporation Commission, Phoenix, by the Arizona Edison Company against the Yuma Utilities Company. The latter is charged with encroachment in the furnishing of electric current to the new Southern Pacific Railroad station at Yuma. It is claimed that the utilities company has authority only outside the Yuma city limits.

# A.I.E.E. News

**Seattle Section, A. I. E. E. Inspects New Substation.**—The Seattle section, A. I. E. E., was recently the guests of the Puget Sound Power & Light Company at the company's new substation in the East Pine Street district, in that city. Members were taken on an inspection trip through the plant. Josepn Hellenthal spoke on "Automatic Substations."

**Los Angeles Section** will meet May 4 at the City Club, 833 South Spring Street. Dinner will be at 6:30 p.m. and will be followed by an illustrated lecture on "The Astronomical Research Work of the Mount Wilson Observatory," by Dr. Ferdinand Ellerman. This is to be the last meeting of the section prior to the vacation period. Women are cordially invited.

# Pacific Coast Electrical Association

## Busy, Pleasant Time Forecast by P.C.E.A. Convention Plans

Fine progress is reported in the plans for the Pacific Coast Electrical Association convention at the Hotel Biltmore, Los Angeles, June 8-11, 1926.

Section chairmen are urged to get the final details of their programs into the hands of Ralph A. Hopkins, Westinghouse Electric & Manufacturing Company, chairman of the program committee, as soon as possible, Tuesday afternoon and Wednesday afternoon have been reserved for the various section meetings.

While it is too early to give final details of the program for the general sessions, the tentative plans call for a number of speakers of national repute and eminence in Pacific Coast affairs. Men qualified to discuss the business and economic situation have been enlisted. Thoughtful discussions of electric cooking and heating, electric refrigeration and electric elevator systems already are provided for definitely.

The general session of Friday morning will be a women's program—not a women's meeting, for all are expected to attend, but a women's program. Some very interesting information on women's participation in the affairs of the industry will be forthcoming at this time.

### The Annual Banquet

Friday evening, June 11, will be the occasion of the annual banquet. R. E. Smith, James Loomer and W. A. Knost as The Three Banqueteers will have charge of the festivities and will be assisted by P. P. Pine, George Bigelow and Eugene McCann. The banqueteers are working on the theory that if all they plan takes place the committee next year will have a hard time to produce something better.

Golf in reasonable quantities, is recognized as a necessary convention accessory. There will be golf, for all who desire that form of education. A visit to one of the motion picture studios is assured for the ladies while the men golf.

While the convention officially closes Friday evening, The Southern Sierras Power Company will be very glad to have as many of the delegates as possible drive to Riverside and enjoy luncheon and golf, also other entertainment, at one of the country clubs in that vicinity.

Very definite opportunities will be offered to the women attending the convention to take part in an important meeting at which problems of particular interest to the women attending the convention will be discussed by prominent speakers. This will be followed immediately by a business luncheon for the women attending the convention.

The entertainment committee assures the ladies it is making plans so that the convention will be not only instructive but enjoyable in every way to those who are fortunate enough to attend, and it hopes there will be a large representation of women so that the men will have plenty to do to keep them busy.

## Correction for Meter Committee Serial Report

**"Low-Cost High-Tension Metering for Operating Purposes,"** serial report of the meter committee, P.C.E.A., appeared on page 295 of the April 15 issue of the Journal of Electricity. **The heading reading "Ratio Error" should read "Ratio Correction Factor."** The corrected manuscript was received in the Journal office too late to incorporate the change in the original article, so that this is the first opportunity available to effect this correction.

# Technical Section Closes Administrative Year and Prepares Next Year's Program

Intensive activities of the Technical Section of the Pacific Coast Electrical Association for the current year were brought to a fitting close at the Fresno conclave April 7-9. With a bona fide attendance of something in excess of 150 the conclave was one of the heaviest in the history of the section.

Contact with the N.E.L.A. committees and the work of the eastern geographic divisions in general is proving of immense value to the Pacific Coast engineers and operating men of the P.C.E.A. Delegates to the general meetings of the Technical National Section brought information regarding Eastern practices and presented a general resume that served to keep the P.C.E.A. members in touch with the other fields. Continued close co-operation between the Pacific Coast and the other geographic divisions is bound to result in mutual benefit to all concerned and of particular benefit to the P.C.E.A. member companies.

### Special and Evening Meetings

Joint meetings were held wherever two or more committees were interested in the same subjects. These joint sessions involved the apparatus, overhead, safety rules and inductive co-ordination committees; the subjects under discussion were grounding, transformer standardization, and supervisory control. One of these joint sessions was held the evening of the first day of the conclave and the other the afternoon of the final day. The committees involved thus were enabled to carry out their regular work without interruption and then get together for the joint business. Reports from the delegates to the eastern meetings were presented to the section assembled in special session Thursday evening, April 8.

### Mr. Baurhyte Praises Section

William Baurhyte, president of the P.C.E.A. and president of the Los Angeles Gas & Electric Corporation, gave an interesting address to the section assembled for luncheon at the Fresno Hotel, Thursday noon, April 8. Mr. Baurhyte spoke appreciatively of the value of the work of the Technical Section to the industry as a whole. According to his own statments, some of the most effective and lasting economies and aid to better service have been the direct result of the unfailing and continued efforts of the Technical Section committees in their studies of the design, construction and operating problems of the industry.

As usual the San Joaquin Power Club came forward and gave all of the delegates to the Fresno meetings a most enjoyable evening Friday, April 9, after the close of all the business sessions. In addition to this, there was a trip to the Balch project of the San Joaquin Light & Power Corporation that was enjoyed by all those that took advantage of it. Many side trips to substations and other points of interest in and around Fresno were available to the men and added to the enjoyment and instructiveness of the conclave.

All arrangement details for the Fresno conclave were cared for by or through L. J. Moore, of the San Joaquin Light & Power Corporation and past chairman of the Technical Section. He was extended a vote of thanks by the section for his program.

### Business Sessions

The business sessions of the various committees best are covered by the summaries submitted by the respective committee chairmen. Therefore these are presented as follows:

## All Aboard for P.C.E.A. Convention

**The Southern Pacific Company has offered for the accommodation of members of the electrical industry in northern California who are planning to attend the P.C.E.A. convention a special train to Los Angeles for 100 fares. By routing the train through the San Joaquin Valley residents of Sacramento, Stockton and Fresno will be given an opportunity to patronize the "special." A round-trip fare from San Francisco of $17.05 is offered, passengers to go to Los Angeles on the special train and return by regular train, with Pullman fare of $9, making a total of $26.05. The train will be of the first class, with diner, observation car, club car, and similar equipment.**

**Reservations for accommodations on this train must be made at once with Samuel H. Taylor, secretary, P.C.E.A., 447 Sutter Street, San Francisco.**

## Accident Prevention Committee

By J. M. BUSWELL, San Joaquin Light & Power Corporation, Chairman

There were 38 members in attendance and discussion was lively and interesting.

Some final discussion was had on the following papers which already have been sent in for the convention issue of the Journal of Electricity: Safety Bulletins, Apparatus and Devices, Identification of Cables in Manholes, and Safe Practices.

A paper on The Foreman was read and there was some discussion. Reference was made to the March issue of Labor Review which includes an article and a code of ethics. The point was emphasized that the foreman is a key man and that one general fault made by foremen is that they do not tell the men what is wrong with them and too seldom praise them for achievement.

Accident statistics was discussed as a subject which should have particular attention in the work of this committee next year. A few additional tools for reducing accident hazards were submitted by Mr. Redinger as developed on the Big Creek construction work of the Southern California Edison Company.

A method of loading, unloading and transporting poles was reported by Messrs. Dickinson and Jordan of this company. It was agreed to have this published with the papers of this committee this year. Dickinson and Jordan also presented an outline or draft of Safe Practices or Accident Prevention Code. After discussing this it was agreed to recommend this subject for next year's continued work.

Under the general subject of tools the matter of the care of rubber gloves was discussed. First-aid supplies, investigation of accidents, the advisability of monthly meetings of superintendents and assistants, the need of statistical charts and the advantages of local committees were discussed.

Three applications for Insull medals, now in process of investigation, were reported by the chairman. Attention also was drawn to the N.E.L.A. Bulletin for March, 1926. This is the national accident prevention number.

The proceedings of the national accident prevention committee were reported and discussed.

## Electrical Apparatus Committee

By J. C. GAYLORD, Southern California Edison Company, Chairman

About 100 members and visitors attended the meetings of the apparatus committee on April 8 and 9.

A short report of the Kansas City meeting of the national apparatus committee was presented by the chairman, in which was evidenced an effort by operating companies throughout the country to make their urban substations noiseless in operation and attractive in appearance.

Papers were presented on distribution substation design as currently used by the Pacific Gas and Electric Company, on special relay applications recently made by Pacific Coast companies, and on the design and operation of oil circuit breakers on this coast.

Consideration was given to the motor rules recently adopted by the Power Club, it being recommended that serious consideration be given to the adoption of these rules by all Pacific Coast operating companies.

Two talks were given by representatives of the manufacturers, one on the subject of static condensers and the other covering the design and operation of ratio changers for changing transformer taps under load.

Joint meetings were held with the overhead systems committee and safety rules committee on the subjects of transformer voltage standardization and grounding, and with the inductive co-ordination committee on the subject of supervisory control.

The following subjects were chosen tentatively for study during the coming year:

1. Oil circuit breakers.
2. Relays.
3. Substation design practice.
4. Fire protection and prevention.
5. Operating methods, routine and facilities.
6. Transformers and regulators.

## Hydraulic Power Committee

By WALTER DREYER, Pacific Gas and Electric Company, Chairman

Clinton de Witt presented a report of the meeting of the national committee at Kansas City. A resolution was made endorsing the stand taken by the parent committee in urging the adoption of a standard draft tube to serve as a "yardstick" or basis with which to compare the performance of other tubes.

The report on "Discussion of Penstock Design and Operation," which was practically complete, then was read and discussed. It was agreed to add to the study which had been proposed at the previous meeting by including more data on air valves and flanged joints and more study on welded pipe before sending the report to the national committee as the contribution of this geographic section to the serial report on this subject.

H. K. Fox, of the San Joaquin Light & Power Corporation gave an illustrated talk on the Kings River project of that company, placing particular emphasis on the Balch development which, when complete, will be the highest head plant in America.

R. S. Quick of the Pelton Water Wheel Company continued his very interesting study on the theoretical side of water hammer. His work since the January meeting has been of a highly constructive nature, resulting in the production of a chart from which the maximum value of the pressure rise readily can be determined in a few minutes where the old step-by-step arithmetical integration method took as many hours.

The national committee is making a statistical study on the mechanical reliability of hydro plants. This work had been summarized for this division for the years 1924 and 1925. E. A. Crellin presented an interesting analysis of the causes of outages, dividing the machines into three groups, i.e., impulse wheels, vertical reaction turbines and horizontal reaction turbines. The necessity for further detail in explaining outages was pointed out, it being felt that otherwise injustice may be done to both the type of installation and the manufacturer. This study is to be continued for at least four more years, and by that time the study will have run a sufficient length of time to warrant definite conclusions as to the points of greatest and of least reliability in this field.

The last session, with J. M. Gaylord of the Southern California Edison Company and vice-chairman of this committee presiding, was devoted to a discussion of new subjects to be studied next year. In line with the new policy of the Technical Section it is intended to begin this study immediately, carrying it through the summer months and permitting a more nearly constant load-factor in this work. The subjects for study are as follows:

1. Handling of stored water.
2. Continuous measurement of water in open and closed waterways.
3. Water level indicators.
4. Operating experience with trash racks.
5. Pressure tunnels.
6. Penstock valves.
7. Continue study on mechanical reliability of hydro plants.
8. Continue study on "Evaporation Losses from Reservoir" by H. W. Cummings of California Institute of Technology.
9. Experiments on water hammer.
10. Continue study on prevention of silt deposits in conduits.

## Inductive Co-ordination Committee

By H. N. KALB, San Joaquin Light & Power Corporation, Chairman.

Meetings were attended by twenty-four delegates and visitors. D. I. Cone, transmission and protection engineer, Pacific Telephone & Telegraph Company, gave a talk on the term "parallel" and showed that the curves published in connection with technical report No. 71 of the inductive interference report were used by the telephone company only as a guide to tell when to consider the possibility of interference being experienced.

In the discussion of radio interference it was stated the Pacific Radio Trade Association is starting a campaign which would take care of many troubles not caused by the power companies but commonly attributed to them. Although this applies to large cities the radio clubs in medium-sized centers and the co-operation of local dealers in small towns are beginning to give favorable results.

The day's work was concluded with considerable discussion on carrier telephone systems.

On April 9 in a joint meeting with the apparatus committee the uses and operation of remote supervisory control were discussed. As this subcommittee only recently has been organized no definite conclusion or recommendations were made. A tentative outline was made as to the program that will be followed to collect data that will be of very great value to operating companies.

## Meter Committee

By R. G. JONES, The Southern Sierras Power Company, Chairman

The meter committee held morning and afternoon sessions on April 7 and 8 with an attendance of some twenty-five.

Reports from all subcommittee chairmen were handed in, and each report

was read and a general discussion followed.

The committee on education of meter men had a very good report in that a particularly successful metermen's short course was held at the California Institute of Technology at Pasadena during the past month. Another class has been arranged for at the University of California at Berkeley and will be held May 17-22.

Reports as covered by the subcommittee chairmen have some important information that is pertinent not only to men directly concerned with meter operation but the various departments charged with operation, distribution and engineering of the utilities properties and plants, and it is the sincere hope of the meter committee that these departments will make use of this information.

Some additional work has been outlined for the meter committee, and by this work we hope to broaden the scope of our activities during the coming year.

## Overhead Systems Committee

By G. A. RILEY, Los Angeles Gas & Electric Corporation, Chairman.

All of the Fresno sessions of the overhead systems committee were well attended. Reports were submitted for publication on the following subjects:

Testing of high-voltage insulators in service.
Live-line maintenance.
Bare wire for distribution.
Life of treated and untreated poles.
Distribution transformer standardization.
Grounding of primary and secondary lines.

The last two reports were presented at a joint session of the overhead systems committee, apparatus committee and safety and safety rules committee. These subjects were studied jointly by the three committees.

Lively discussion followed the presentation of each of the reports indicating that there is much work yet to be done on a number of them. The study of the Life of Treated and Untreated Poles has been the means of awakening a number of utilities to the fact that termites are much more prevalent than it was supposed before careful investigation was started. From present indication it seems that full-length treatment of the poles is desirable, as well as the treatment with creosote of the crossarms and wooden pins.

A progress report was presented by the subcommittee appointed to study the proposed standard gage for 1-in. pin holes in insulators in which several members had reported the gage as satisfactory. In the discussion, however, it seemed evident that the subject should be studied further, and it was recommended that the committee be continued, including recommendations for a pin gage also, which the discussion showed to be desirable. In addition to the above subject the following subjects were proposed for consideration by the committee in their next year's work:

Details of construction.
New 220-kv. construction.
Maintenance of steel poles and towers.
Grounding of primary and secondary lines.
Study of pole life.

The last two are a continuation of this year's subjects.

## Prime Movers Committee

By J. W. ANDREE, Southern California Edison Company, Chairman

The prime movers committee held its Fresno meeting in two sessions on April 7. Reports of the minutes of the Kansas City and Boston meetings of the N.E.L.A. prime movers committee were read.

Final reports on the following subjects were read and discussed:

Condensing equipment.
Burning of liquid and gaseous fuels.
Heat balance and auxiliaries.

The condensing equipment report has been published as a serial report appearing in the Journal of Electricity April 1, p. 259. The other two reports will appear in the June convention issue of the Journal.

Preliminary reports were rendered on Cooling Towers and Spray Ponds and Standby Plant Design. Final report on Cooling Towers and Spray Ponds will be made before June 1, and this will appear as a serial report of the committee.

Standby Plant Design is being combined with Standby Plant Operation as a new subject for investigation by next year's committee. Other new subjects to be studied by next year's committee are Treatment of Boiler Feed Water and Boilers, Furnaces and Accessories.

In addition to these new subjects, next year's committee will continue studies on:

Condensing equipment.
Burning of liquid and gaseous fuels.
Heat balance and station auxiliaries.

At the conclusion of the meeting the chairman read an interesting paper on system operation, dealing with the economical phase of operation of steam and hydro plants. This paper will be published in the near future in the Electrical World.

## Safety Rules Committee

By W. R. FRAMPTON, Southern California Edison Company, Chairman

Several committee members had submitted data covering test requirements which were presented and discussed at length. The discussion became quite general on the possibility of standardizing on a definite test device. It was suggested that at least an endeavor be made to take definite action on a switch providing testing facilities for installation requiring switches up to and including 100 amp. 600-volt capacity.

A resolution was passed unanimously favoring incorporating isolation-test devices on switches up to and including 100 amp., 600-volt capacity. This represents a definite accomplishment and gives a basis upon which to build future action.

The committee listened to an address by H. W. Stitt, city electrician of Fresno, also past president of the California Association of Electrical Inspectors, on the subject of co-operation of the inspectors with this committee on standardizing and increasing scope of inspection in the state.

One manufacturer submitted a switch with test devices that was correct in principle but would need some modifications in mechanical design. Manufacturers will be asked to submit switches with test devices in accordance with specifications as outlined by the committee.

## Underground Systems Committee

By P. E. CHAPMAN, Pacific Gas and Electric Company, Chairman

Transformer Vault Location and Design for Heavy Loads was the opening topic discussed in the underground systems committee. Short reports covering this important subject were given by H. G. Keesling, R. P. Lutzi, A. J. Theis and C. H. Jenkins of the committee. Blueprints were submitted giving the size of transformer vaults together with the location of the equipment installed in them.

An interesting paper was presented by H. C. Moyer covering the design of a manhole ventilated by means of an air shaft built outside of and along the hole to be cooled.

Prevention of electrolysis on electric underground cables was covered in a report by Paul Suransky, taking an actual case of trouble which occurred and explaining how it was corrected.

B. A. Williamson, of the Los Angeles Gas and Electric Corporation, reported on his experiences in electrolysis surveys in the city of Los Angeles. He brought out many points of interest, a number of which will be recommended by this year's committee for study next year.

The association which has been formed in Oakland to follow electrolysis was explained by Mr. Moyer. This association handles all electrolysis work for the various utilities which are members and has functioned very satisfactorily.

G. H. Hagar rendered a report on the maintenance of the submarine cable of the Great Western Power Company that extends from San Francisco to Brooks Island. The report was extremely interesting as this is the first installation in San Francisco Bay where no lead armor is used.

A number of submarine power cables in San Francisco Bay have been installed by A. J. Pahl. Mr. Pahl gave a short talk on his experience in the installation of them. His comparison of submarine cable with and without lead armor was very instructive. A number of X-Ray photographs were submitted by N. B. Hinson of the Southern California Edison Company. These were taken in Seattle by M. T. Crawford of the Puget Sound Power & Light Company, and presented a new method for the detection of faulty rubber insulation on submarine cables having no lead armor.

Determination of the temperature of underground cables and the apparatus used for this work was thoroughly covered in the papers explained by G. L. Hill. His talk was illustrated with a number of carefully prepared charts.

The national underground systems committee meeting held at Kansas City was reviewed fully by H. H. Buell who attended that session.

The chairman closed the meeting with a report of the year's work of his committee, suggesting possible subjects for next year's study.

# News of the Electragists

Hardy sailors all? A number of the delegates to the convention of the California Association of Electrical Inspectors made the trip to San Diego from San Francisco aboard the Yale. Others from southern California boarded the boat at Los Angeles. It was a very pleasant trip, and no cases of seasickness were reported.

Left to right—C. D. ("Dent") Slaughter, Allied Industries, Inc., San Francisco; Will H. Davie, Allied Industries, Inc., Los Angeles; B. C. Hill, supervising electrical inspector, Oakland; George E. Kimball, Industrial Accident Commission, and Claude W. Mitchell, Board of Fire Underwriters of the Pacific, both of San Francisco.

## Sacramento Contractors and Dealers Association Reorganizes

A reorganization of the Electrical Contractors and Dealers Association of Sacramento, Calif., has been effected as the result of a recent meeting held at the Travelers Hotel in that city. The speakers of the evening were George Eldridge, of the California Electragists, and T. S. Curran, Pacific Gas and Electric Company, who is district chairman of the Red Seal plan.

Mr. Eldridge outlined the purpose of the Red Seal plan and also talked on the subject of organization and cooperation, stressing the value of meeting together and discussing the problems of the business. Mr. Curran gave the details of the Red Seal plan and told how the power companies are cooperating with the electrical contractor in selling more than an ordinary job of wiring to the public.

The first Red Seal home in Sacramento is being built by Frank Williams, a home-builder. C. F. Vining, Clifford Prudhomme, and L. M. Sherman were appointed as a committee to secure publicity for this house. It has been approved as one of the official homes to be displayed during Better Homes Week.

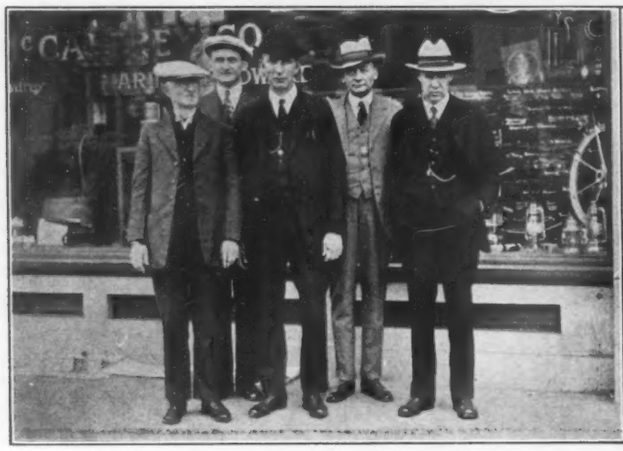
There are twenty-three members of the association. The officers are as follows: president — R. J. Finchley, California Mechanical & Electrical Engineering Company; vice-president—Carl F. Vining, Standard Electric Works, and secretary—E. M. Miller.

---

**Colorado-Wyoming Electrical Contractors and Dealers Association formed at Meeting in Denver.**—During the state-wide meeting of electrical men in Denver, Colo., March 26, the Denver Electrical Contractors Association was host at a luncheon to all visiitng contractors, and from that gathering a movement was started which resulted in the organization of the Colorado-Wyoming Electrical Contractors and Dealers Association. Matt Whitney of Colorado Surings was named president; W. A. J. Guscott, Denver, vice-president, and P. Harry Byrne, Denver, secretary and treasurer. Sixty-two contractors attended the meeting, twenty-nine from outside of Denver.

---

**California Electrigists to Meet in Sacramento May 21.**—The next quarterly meeting of the Northern Division of the California Electragists will be held in Sacramento at the Hotel Senator on Friday, May 21. For the benefit of the delegates from the San Francisco Bay territory a special boat will leave San Francisco Thursday night, May 20.



A hardy group of inspectors at the convention of the California Association of Electrical Inspectors which was held in San Diego. Left to right—F. C. Colville, San Leandro; James M. Evans, Board of Fire Underwriters of the Pacific, Los Angeles; J. C. Hamilton, San Jose; Walter Scott, Burlingame; and W. E. Brothers, Berkeley.

Caught in the act of working! They chose a cosy spot on the roof of the Hotel San Diego, however, where it was very comfortable during the convention. From left to right—B. C. Hill, Oakland; R. H. Manahan, Los Angeles; and E. J. Crawford, San Joaquin Light & Power Corporation, Fresno.

# Meetings

## E. O. Shreve Honored at League Farewell Dinner

Tributes such as are given to few men were paid to E. O. Shreve by four noted speakers at a farewell luncheon given in his honor by the San Francisco Electrical Development League April 12. While the theme set for the day was centered about the idea that California is an ideal training school for industrial executives by reason of the great diversity of its industrial developments, speakers digressed from this thought to pay particular honor to Mr. Shreve, who has been promoted from San Francisco manager of the General Electric Company to the post of manager of the industrial department of the company with headquarters in Schenectady, N. Y.

W. E. Creed, president of the Pacific Gas and Electric Company, was the first speaker introduced by chairman of the day, C. E. Heise, manager of the San Francisco district office of the Westinghouse Electric & Manufacturing Company. Mr. Creed spoke of the heritage Californians received from the pioneers and emphasized the place that effort has in the building of character and leadership.

C. W. Banta, vice-president of the Wells Fargo Bank and Union Trust Company, the next speaker, analyzed the quality of friendliness which characterises great men, investing Mr. Shreve with this quality.

A. B. C. Dohrmann, director of the California Development Association and well known merchant, spoke of the variety of interests in all California life which make for the broad training and outlook necessary to large industrial undertakings.

Dr. Thomas Addison, for long the head of the General Electric Company's Western work, gave an account of Mr. Shreve's history with the company from the time he began, during the days following the San Francisco disaster of 1906, when he dug post holes for a supply yard in Oakland, up to his present promotion. He took occasion to point out the various qualities that each new responsibility given Mr. Shreve had discovered in him.

Mr. Shreve in a brief response thanked his friends and associates.

A record attendance marked the meeting, over 400 being present to pay honor to Mr. Shreve. Delegations from Los Angeles and Oakland were present, and many notable men in the industrial life of the state were seated at the speakers' table.

## Bureau Advisory Committee Meet Centers on Red Seal Plan

Effective measures for popularizing the Red Seal Plan to an extent that would justify its acceptance by builders and realtors as a sales feature in the houses they build was one of the important subjects discussed at the meeting of the advisory committee of the California Electrical Bureau held in San Francisco April 12. It was agreed generally that one of the greatest aids in obtaining the desired result would be the appearance of several full-page advertisements in general media of national circulation, and steps have been taken to call to the attention of The Society for Electrical Development the need for such advertising, with the request that it be carried as an immediate national benefit to the Society's contributors.

A progress report showed that forty-two new Red Seal homes had been started in nineteen districts during March. Another report that caused much gratification was one which listed twenty-one electrical contractors who are contributing financially to the Bureau, evidencing the support that the contractors are rendering to the organization. It also was reported that a folder presenting the story of the Red Seal Plan in its appeal to architects, builders and realtors shortly would be off the press for distribution by district chairmen.

The Red Seal cards being used by the Los Angeles Gas and Electric Corporation as a direct follow-up in the interest of the Red Seal Plan on each residence job for which a permit is taken out in Los Angeles were discussed. An outline of the company's plan and a supply of the cards are to be distributed to all district chairmen.

Other matters handled at the meeting were the decision that notices of all meetings of the advisory committee be sent to all Bureau subscribers with an invitation to attend, and the appointment of A. H. Nicoll, sales manager, Graybar Electric Company, San Francisco, as chairman of the state advertising committee, succeeding M. W. Scanlon, resigned.

The next meeting of the committee will be held in Los Angeles, June 7, at the Jonathan Club.

### COMING EVENTS

**National Electric Light Association—**
Annual Convention—Atlantic City, N. J.
May 17-21, 1926.

**California Electragists, Northern Division—**
Quarterly Meeting—Hotel Senator
Sacramento, Calif.
Friday, May 21, 1926

**Electrical Supply Jobbers' Association—**
Annual Convention—Hot Springs, Va.
May 31-June 4, 1926

**Advisory Committee, California Electrical Bureau —**
Jonathan Club, Los Angeles, Calif.
June 7, 1926.

**Pacific Coast Electrical Association—**
Annual Convention—Biltmore Hotel, Los Angeles
June 8-11, 1926

**Associated Manufacturers of Electrical Supplies—**
Annual Convention—Hot Springs, Va.
June 7-12, 1926

**Northwest Electric Light and Power Association —**
Annual Convention—Spokane, Wash.
June 14-17, 1926

**American Society of Agricultural Engineers—**
Annual Convention—Tahoe Tavern,
Lake Tahoe, Calif.
June 23-26, 1926

## Oakland Electric Club Elects Officers for the Year

Robert S. Prussia, salesman and district illuminating engineer for the Westinghouse Lamp Company, was elected president of the Oakland Electric Club at its meeting March 22. He will succeed Ben C. Hill, supervising electrical inspector of Oakland, Calif., president for the past year.

Other officers named were: Walter Vance, Pacific Electric Motor Company, vice-president; Joseph Marra, Pacific States Electric Company, secretary-treasurer; and Sam G. Gearhart, General Electric Company. Romaine W. Myers, consulting electrical engineer; U. N. Petersen, Quality Electric Motor Company; and Ben C. Hill, city of Oakland, were elected members of the board of directors.

Mr. Prussia in taking office announced that he would outline to the club at its first meeting in April a plan for strengthening the club organization and for building up the membership and attendance of the club.

# Book Reviews

## MANUFACTURERS OF THE STATE OF WASHINGTON

Published by the Manufacturers' Association of Washington, Silver edition (eighth) commemorating "The First Twenty-five Years" of organized work among industries of the state. Limp leather binding. 346 pages. $7.50 postpaid. Manufacturers' Association of Washington, Arctic Bldg., Seattle, Wash.

An attractive directory, satisfyingly complete in all particulars, is the Silver, or eighth, edition of the Manufacturers of the State of Washington, just published by the Manufacturers' Association of Washington, Seattle. The book is called the silver edition in commemoration of the "first twenty-five years" of organized work among the industries of Washington.

Divided into three main sections, the directory provides an excellent cross-index of all manufacturing enterprises in the state. There are listed 5,145 enterprises, located in 524 different localities. There are in the new edition 36 per cent more firms than in the previous edition, and 226 more than that given in the federal enumeration in 1920.

Each listing is given in alphabetical order with addresses, telephone numbers, executive officers, capacities, number of employees and principal products. The first listing is in alphabetical order. This is followed by a geographical listing and later by a listing by commodities. In the latter the Washington factories are given 14 000 listings. Copyright features of the book include logging operations, the year the firm began producing, and in addition to the usual company officers, the credit, traffic and export managers, a list of brands and trademarks.

# Personals

**R. M. Alvord,** since 1917 sales manager of the San Francisco office of the General Electric Company, has been appointed district manager for that company. He succeeds **E. O. Shreve,** now manager of the company's industrial department with headquarters

R. M. ALVORD

in Schenectady. Mr. Alvord's first sales experience was gained selling groceries in his father's store. He left that work to enter Iowa State College at Ames, from which he was graduated in 1904 with the degree of B.S. in electrical engineering. In that same year he entered the employ of the General Electric Company as student engineer. Two years later he was sent to the Pacific Coast as a supply salesman, and in 1910 he was made manager of the supply department. He held that position until 1917 when he was appointed sales manager of the San Francisco office. Mr. Alvord takes an active and enthusiastic interest in affairs of the electrical industry. He was one of the organizers of and always has been a leading spirit in the San Francisco Electrical Development League. He also was one of the leaders in the organization of the California Electrical Co-operative Campaign, now the California Electrical Bureau, and has served as a member of the advisory committee for many years. He has served on the executive committee of the Pacific Coast Electrical Association and on various committees of the Commercial Section of that organization. Some of Mr. Alvord's other interests and activities include a directorship of the Pacific States Electric Company and of the Pacific Coast Contract Purchase Corporation, of which latter he is vice-president, membership in the San Francisco Sales Managers Association, of which he was president in 1916, and membership in the Rotary, Commonwealth and Berkeley Country Clubs.

**W. L. Frost,** of the Southern California Edison Company, Los Angeles, made a recent business trip to Visalia.

**F. L. Hansen,** sales manager of the Ideal Electric & Manufacturing Company, Mansfield, Ohio, recently visited the Pacific Coast. While in San Francisco he conferred with **A. J. Myers,** district agent of the company, and returned to Mansfield by way of Los Angeles.

**W. A. J. Guscott,** prominent Denver electragist and official of the Electrical League of Colorado, has moved his office and shop from 1100 California Street to Room No. 1 of the Chember of Commerce Building, 1726 Champa Street. The new location provides ground floor space double the old facilities and in the heart of the Denver business district.

**Arthur P. Peck,** formerly Sacramento representative of Fobes Supply Company, has been appointed manager of that company's Oakland branch. He has been succeeded by **W. I. Powell,** formerly in charge of the territory north of Sacramento. **Dan O'Driscoll,** who has had charge of radio for Fobes Supply Company in San Francisco, has taken Mr. Powell's place.

**Leigh S. Jones,** for many years purchasing agent of the California Oregon Power Company with headquarters in San Francisco, has resigned that position to establish himself as a general purchasing agent for industrial plants and others. Mr. Jones has opened offices in the Matson Building, San Francisco.

**H. H. Allison,** who has had charge of the kitchen lighting campaign on the system of the Great Western Power Company of California, has been made sales agent for Contra Costa County. He succeeds **W. B. Sedgley,** who has been advanced to the position of sales engineer in the Oakland district with headquarters in Oakland.

**E. J. Willits,** formerly assistant underground engineer, Bureau of Power and Light, Los Angeles, now is assistant electrical engineer for the Associated Oil Company of California, with headquarters in San Francisco.

**E. D. Stewart,** branch manager of the Westinghouse Electric & Manufacturing Company, El Paso, and **W. G. Willson,** manager of the company's Phoenix office, lately spent some time in Los Angeles for a brief business conference.

**George Campbell,** general manager Truckee River Power Company, Reno, Nev., visited San Francisco lately to attend the farewell dinner given by **Carl F. Braun,** of C. F. Braun Company, Los Angeles, in honor of **E. O. Shreve,** who has resigned as San Francisco district manager of the General Electric Company to accept the managership of the company's industrial department at Schenectady. **S. E. Gates,** Los Angeles district manager of the General Electric Company, made a special trip to San Francisco also to attend the dinner.

**D. L. Huntington,** president, The Washington Water Power Company, recently returned to Spokane from a six-weeks' trip to New York City and Washington, D. C.

**A. N. Cudworth,** assistant secretary and assistant treasurer, Northwestern Electric Company, Portland, recently resigned to become associated with the Robert Morton Organ Company, San Francisco.

**Robert Davie,** of the New York sales offices of the Graybar Electric Company, has been appointed district sales development specialist for the Western district, with headquarters at Kansas City, Mo. This territory includes the cities of St. Louis, Omaha, Denver, Salt Lake City and Memphis. Mr. Davie will be in charge of all engineering work in connection with the sale and installation of public-address equipment and other applications of electrical amplification apparatus.

**L. M. McKey,** until recently office manager for H. B. Squires Company, Los Angeles, has joined the staff of the Frank Adams Electrical Company of that city.

**J. H. McCabe** has resigned his position on the sales force of the Westinghouse Electric & Manufacturing Company in Denver to become associated with the American Ventilating Company in that city.

**Charles Heston Peirson,** or "Charlie" Peirson as he is known best, director of public information for the Southern California Edison Company, Los Angeles, has been appointed an assistant vice-president of that organization. Mr. Peirson, who entered the service of the Edison company about twenty years ago as advertising manager, is among the oldest professional writers in America, having commenced when a boy of fourteen as a waterfront reporter in New York City, and is now in his sixty-seventh year. While a war correspondent during the Spanish-American war, he accompanied the expeditionary forces of the army to San Juan, Porto Rico, and was admitted to the bar of the United States Court under the provisional government but never practised. He came to the service of John B. Miller, president of the Edison company, after long experience

CHARLES HESTON PEIRSON

in editorial and executive positions in the general offices of the Associated Press in New York City and with metropolitan papers in the East. The years he has spent with the Edison company have been coincident with its absorption of many other companies into its present organization. He is best known to the newspaper publishers as the originator of the Edison plan of display advertising, which has been adopted very generally and standardized by the larger public utilities of the country.

**W. R. Putnam,** vice-president and general manager, Idaho Power Company, Boise, recently made a business trip to San Francisco.

**J. Robert Crouse,** vice-president, Electric Refrigerator Corporation, and a director of the Society for Electrical Development, Inc., paid a visit to San Francisco a short time ago for the purpose of organizing local electric refrigerator distributors in order that they might tie in with the general sales promotion campaign for electric refrigeration now under way under the auspices of the Society for Electrical Development. Mr. Crouse recently was awarded the McGraw Medal for co-operation.

**J. G. Hawkins,** recently named assistant secretary and assistant treasurer, Northwestern Electric Company, Portland, to succeed **A. N. Cudworth,** resigned, went to that office from the position of assistant treasurer, Portland Gas & Coke Company and Pacific Power & Light Company, Portland, which he had held since early in 1926. He was born in Kent, Ohio, 1886, and after going through the public schools of Cuiahoga, Ohio, he entered the employ of the Northern Ohio Traction & Light Company, Akron, in 1903. In September, 1904, he went to Portland, entering the accounting department of the Portland Consolidated Railway Company, and remained with that company and its successor, the Portland Railway, Light & Power Company, until 1909. In May of that year he took a position with the Astoria Electric Company, Astoria, Ore., one of the properties that was consolidated with the incorporation of the Pacific Power & Light Company in June, 1910. Coincident with the formation of this new company, Mr. Hawkins was transferred to the Portland office, and successively has held the positions

J. G. HAWKINS

of chief clerk at Portland office, traveling auditor, chief engineering accountant, statistician, and assistant treasurer. Since 1918 he has been a joint employee of the Portland Gas & Coke Company, whose controlling interests likewise control the Pacific company. Since the same interests now direct the affairs of the Northwestern Electric Company, Mr. Hawkins' present appointment is a promotion to larger responsibilities coming after seventeen years continuous service to those interests.

**E. L. Trowbridge,** formerly connected with the Southern Electrical Company, San Diego, Calif., now is associated with the Southern California Edison Company, Los Angeles.

**E. M. Herr,** president of the Westinghouse Electric & Manufacturing Company, recently spent two days in Seattle and spoke before the Chamber of Commerce members' council at its weekly meeting.

**J. L. Stannard,** chief engineer of the Lake Cushman power project of the city of Tacoma, recently spoke before the Seattle Engineers' Club on the Lake Cushman development.

**A. G. Wishon,** president, San Joaquin Light & Power Corporation, Fresno, Calif., accompanied by Mrs. Wishon, left recently for a trip to Europe.

**T. S. Louttit,** attorney of Stockton, Calif., has been appointed by Governor Richardson as a member of the California Railroad Commission to fill the unexpired term of the late George D. Squires.

**Charles Neely,** division manager for the Idaho Power Company at Twin Falls, Idaho, was one of a group of business men from that city who visited San Francisco not long ago.

**A. E. Griswold,** president, the A. G. Manufacturing Company, Seattle, was among those who attended the convention of the California Association of Electrical Inspectors held recently in San Diego. **H. F. Yost,** Pacific Coast manager, Trumbull Electric Manufacturing Company, **Arthur Kempston,** of the Majestic Electric Appliance Company; **C. D. Slaughter,** of Allied Industries, Inc.; and **Grover A. Anderson,** of the J. G. Pomeroy Company, all of San Francisco, as well as **S. R. Moffat** and **F. E. Downing,** of the Rome Wire Company, New York and Chicago, respectively, were others who were in attendance at the convention.

**W. L. Frost,** general commercial manager, Southern California Edison Company; **H. H. Walker,** electrical contractor; **P. H. Booth,** vice-president, Edison Electrical Appliance Company; and **Frank Airey,** manager, Pacific States Electric Company, were among the Los Angeles electrical men who sat at the speakers' table at the meeting of the San Francisco Electrical Development League held recently in honor of **E. O. Shreve,** manager of the industrial department, General Electric Company, Schenectady, N. Y. **H. H. Courtright,** manager of the Valley Electrical Supply Company, Fresno, also made a special trip to San Francisco to attend the meeting.

**O. R. Doerr,** manager of the heater and lamp division of the Magnavox Company, Oakland, has returned from an extensive Eastern trip.

**V. H. Greisser,** chief engineer, The Washington Water Power Company, returned to Spokane from Washington, D. C., a short time ago.

**James W. Ryall,** one of the organizers of the B. & R. Electrical Supply Company of Denver, has disposed of his interests to return to his former position with the Mine & Smelter Supply Company as manager of the electrical department in Denver. He succeeds **A. E. Bacon,** who has resigned to become the representative of the National Metal Molding Company in the Mountain territory.

**Will H. Fischer,** for some time past manager of the greater service department, Southern California Edison Company, has been appointed an assistant vice-president of the Edison company. Mr. Fischer began his career as a newspaper reporter in San Francisco twenty-seven years ago. He was employed in various capacities, as reporter, editorial and feature writer on several papers of that city. He was best known, perhaps, as a reporter of national conventions; he wrote the story of the nomination of Roosevelt, Taft, Harding, who were elected, and of Parker who was defeated. He was

WILL H. FISCHER

for some time editor and manager of the Humboldt Times of Eureka; later an editorial writer on Los Angeles papers. Previous to joining the forces of the Edison company he was engaged in tax research work and was well known as a writer on these and other economic subjects.

**Hugh A. Smith,** formerly division engineer at Boise for the Idaho Power Company, has resigned to take up a similar line of work with the Longview Public Service Company, Longview, Wash.

## Obituary

**Frederick Gordon Cartwright,** connected with the electrical industry of the West for the past thirty-five years, died in San Francisco April 10. Born in Deep Creek, Va., and educated in Boston, he spent a number of years as construction and electrical engineer with Eastern electric companies. He arrived in San Francisco in 1890 and became assistant general manager of the Electric Improvement Company. He also acted as special agent for the Fort Wayne Electric Corporation, Fort Wayne, Ind., in that capacity laying out and supervising electric and steam plants in many Pacific Coast cities. He held various managerial and engineering positions with early light and power companies in San Francisco. During the latter part of his career he acted as consulting electrical engineer.

# TRADE NOTES

**Electrical Equipment Company,** Butte, Mont., are exclusive distributors for Apex-Rotarex merchandise for Oregon, Washington, northern Idaho and Montana. **H. P. Whitten,** general manager of the concern, has taken charge of opening direct branches at Portland, Butte and Spokane, in addition to the branches established at Seattle and Tacoma.

**W. P. Fuller & Company,** San Francisco, has issued a new industrial paint bulletin on the subject of painting light colors over bituminous compounds. The bulletin describes the uses of "Ful-Lumina" paint, especially for covering surfaces which previously have been painted with bitumens.

**Roy E. Hanson,** Los Angeles, manufacturer of differential recorders, flow indicators, no-flow alarms, orifice plates and Venturi meters, has announced the perfection of the Han- transformer flow indicator for use in transformer cooling water systems. The new device is made in two sizes, 0 to 12 gal. or 24 gal. and 0 to 15 or 30 gal. The indicator is also applicable for steam, oil or air.

**Electric Storage Battery Company,** Philadelphia, is furnishing the electric storage batteries for the new S.S. Malolo now under construction for the Matson Navigation Company. She is said to be the largest and fastest high-powered passenger steamship ever built in this country. The launching is expected to take place in the spring.

**Erie Malleable Iron Company,** Erie, Pa., has issued an 80-page booklet on Kondu fittings. Photographic illustrations and complete price lists are given in the booklet, and the labor and cost-savings features are defined.

**Federal Electric Company,** Chicago, celebrated its twenty-fifth anniversary in the electrical industry recently. The founders of the business, John F. Gilchrist and James F. Gilchrist, were guests of honor at a dineer given for the directors and members of the firm.

**Redwood Manufacturers Company,** San Francisco, has issued two new booklets covering its products. Catalog No. 11 is a handbook of information for hydraulic engineers relating to Remco redwood pipe. In addition to dealing with installations and applications of redwood pipe, the book has many valuable hydraulic tables. Catalog No. 21 deals with Remco redwood tanks. It sets forth the principles involved and general instructions for building foundations and setting up redwood tanks.

**Wagner Electric Corporation,** St. Louis, is furnishing large display cards showing the half-length figure of a boy. A fan in the foreground is connected and trained on the card. Breezes from the fan set the boy's tie fluttering, the motion attracting the attention of the passerby. These cards are being distributed for window displays.

**Ludlum Steel Company,** Watervliet, N. Y., is building a continuous furnace of modern construction and design for billet heating. In the recuperative equipment is employed Ludlum's own heat and scale-resisting material, as well as its Delhi Tough which is used in tube form in this equipment.

**Edwin L. Wiegand Company,** Pittsburgh, electrical heating engineers and manufacturers of Chromalox heating units, has announced that **W. Hunter Snead,** former publicity division manager of the Westinghouse Electric & Manufacturing Company, has become its advertising and sales promotion manager.

**The Swartzbaugh Manufacturing** Company, Toledo, Ohio, has issued a small folder descriptive of its Everhot electric cooker. Photographs showing the different types with extra equipment and complete price lists are given.

**The Brown Instrument Company,** Philadelphia, has issued a new 76-page booklet, "Instructions for Installation and Care of Thermo-Electric Pyrometers." The book contains numerous diagrams and photographic illustrations.

**Curtis Lighting, Inc.,** Chicago, has announced a new fixture, known as the X-Ray control ring, No. 13351, which when attached to X-Ray show window floodlight No. 33 or X-Ray projector No. 51, converts the unit into a spotlight.

**Electrical Testing Laboratories,** New York City, have issued bulletin No. 101 on testing, inspection and research work on impregnated, paper-insulated lead-covered cable.

**Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., has issued circular No. 1670-A, a discussion of power factor, its correction and the selection of corrective equipment, with numerous tables and charts.

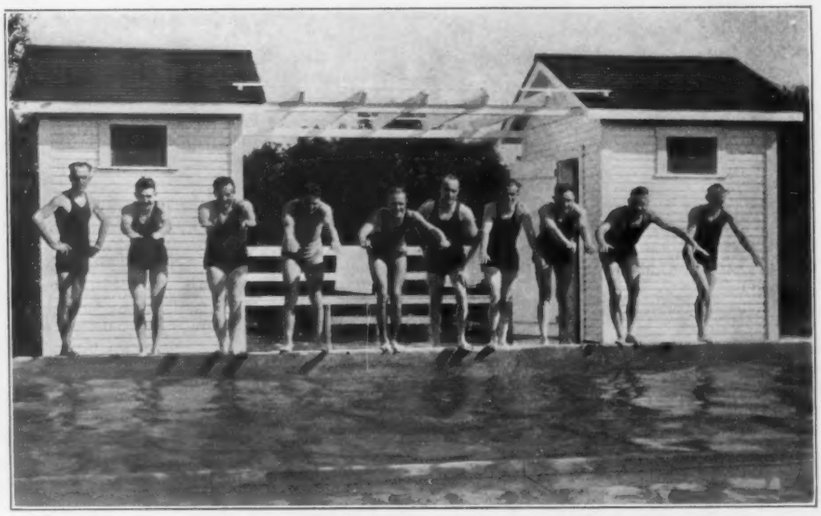
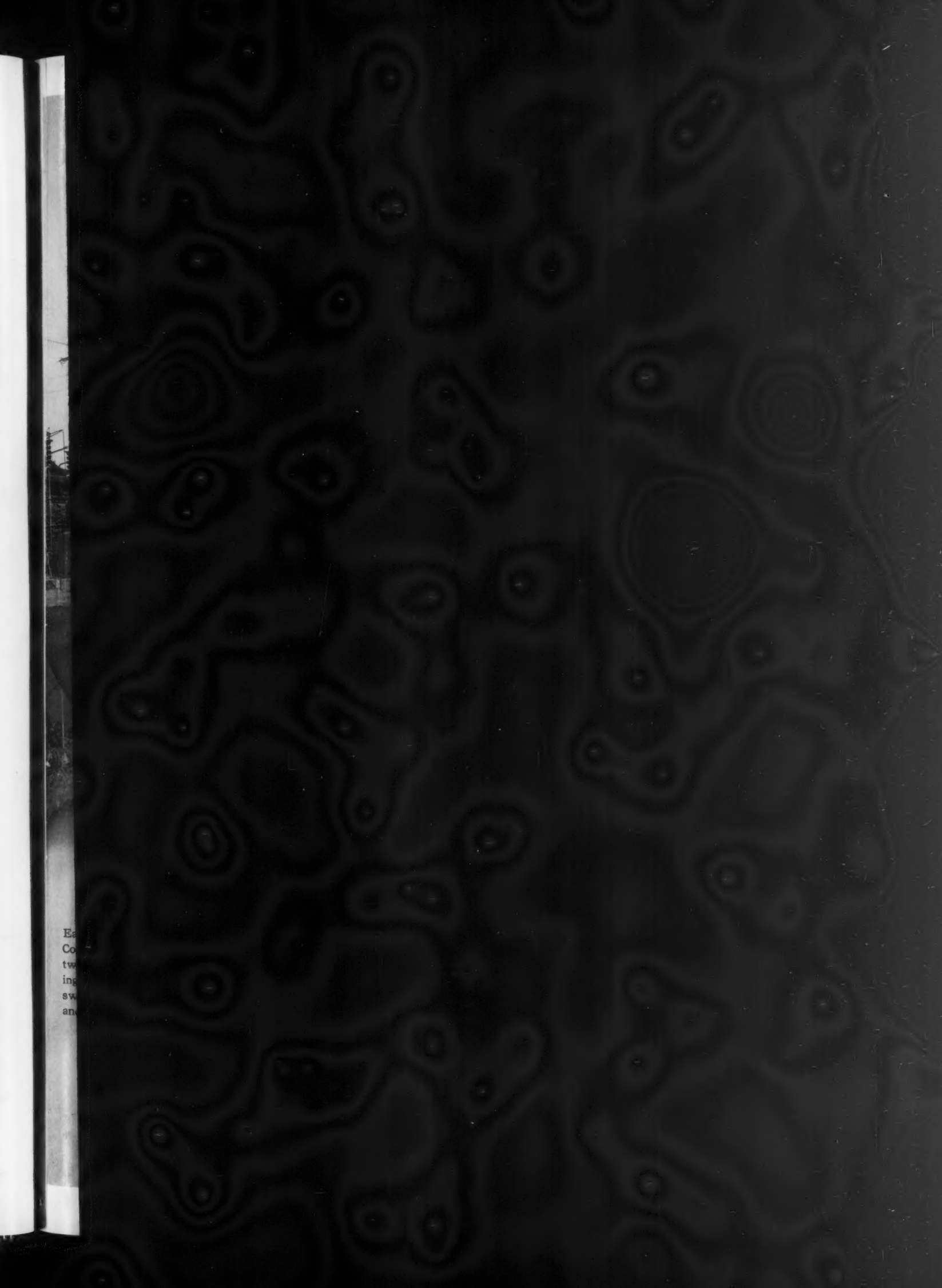
**Designator Manufacturing Company,** 316-420 Sixth Street, San Francisco, is manufacturing an electrical, revolving designator to be used to indicate beauty parlors, as the red and white pole designates barber shops. It is made in two styles, pedestal 81 in. high and 12 in. in diameter, and bracket 45 in. long and 12 in. in diameter, each style showing two feminine heads.

**Celite Products Company,** Los Angeles, has issued bulletin No. 317, containing specifications covering diatomaceous silica as an admixture in concrete, as well as typical specification clauses covering the use of Celite as an admixture.

**General Electric Company,** Schenectady, has issued bulletin No. 352 on Capacitors. The bulletin is illustrated with photographs of the capacitor and various methods of installation. Its economies and other advantages are covered thoroughly in the booklet.

**The Rix Company, Inc.,** San Francisco and Los Angeles, is the new name of the Rix Compressed Air & Drill Company, which has been reorganized with an increased capital stock to take care of increased business. The officers of the new company are **A. E. Rix,** president; **Austin Rix,** vice-president; **M. L. Hewett,** secretary and sales manager, and **R. W. Arns,** director and manager of the Los Angeles branch. The San Francisco office is located at 400 Fourth Street, and in Los Angeles the concern is established at 419 East Third Street.

**Pacific Foundry Company,** San Francisco, has issued recently bulletin No. 90 on Corrosiron, a product developed and produced by the company. The booklet is illustrated with photographs and drawings and contains complete price lists.



**What a pity there is no Mack Sennet interested in bathing beauties of the male gender! This is the original cast of those touching verses, "many a flower is born to blush unseen and waste its sweetness on the Pasadena air." For here are no other than some of the notables at a recent sales meeting of Listenwalter & Gough, held in Pasadena. History also goes on to say that some actually took to the water, too, which is more than can be said of Mack Sennet's w.k. "hotsies-totsies."**